LOOMACRES
Wildlife Management

Wildlife Hazard Assessment

of the

Frederick Municipal Airport

2016-2017

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I. Introduction

Bird and other wildlife strikes have cost the U.S. civil aviation industry over $631.8 million in direct monetary losses and an estimated981,200 hours of aircraft downtime since 1990 (Dolbeer et al. 2015). During the 25-year period between 1990 and 2014, a total of 156,114 strikes had been reported. These strikes occurred with 518 species of birds, 41 species of terrestrial mammals, 21 species of bats, and 17 species of reptiles were identified as struck by aircraft. Waterfowl, gulls, and raptors are the species groups of birds with the most damaging strikes. Of the 151,267 avian strikes 9% had indicated some level of damage to the aircraft, and 2% (3,334 strikes) indicated substantial damages (Dolbeer et al. 2015). During the same 25-year period, there were 3,360 terrestrial mammal strikes reported, of which 31% had indicated damage to the aircraft (Dolbeer et al. 2015). Birds were involved in 96.9% of the reported strikes, terrestrial mammals in 2.2%, bats in 0.6%, and reptiles in 0.1% (Dolbeer et al. 2015).

Since 1988, wildlife strikes have killed more than 258 people globally and destroyed over 245 aircraft (Dolbeer et al. 2015). Eighty percent of wildlife strikes occur in the airport environment (Cleary et. al. 1999). The January 2009 near-tragedy of US Airways Flight 1549, in which a bird strike during takeoff from New York's LaGuardia Airport forced the plane to land on the Hudson River, underscores the necessity to address the problem of managing wildlife hazards for all airports.

Pursuant to 14 Code of Federal Regulations, Part 139, Certification of Airports (Part 139), FAA certificated airports serving certain scheduled air carrier operations (in aircraft with more than 10 passenger seats), as well as certain unscheduled air carrier operations (conducted in aircraft with more than 30 seats) airport operators are required to comply with certain safety and operational requirements, including requirements to prevent and mitigate wildlife hazards to airports. Even though owners of GA airports are not regulated under Part 139, as discussed above, many are recipients of Federal funds for airport development projects and land acquisition. In exchange for Federal airport development assistance, airport owners make binding commitments to assure the public's interest in civil aviation will be served. Such responsibilities are commonly referred to as Federal grant obligations or grant assurances. The FAA has a statutory mandate to ensure airport owners comply with their grant obligations (See 49 U.S.C. 47101 et seq.). Federal obligations include the responsibility to preserve and operate an airport in a safe and efficient manner, pursuant to FAA regulations and standards, specifically, Grant Assurance No. 19 requires the airport owner to operate its airport in a safe and serviceable condition and in accordance with the minimum standards as may be required or prescribed by applicable Federal, state and local agencies for maintenance and operation. This includes FAA standards for mitigating wildlife hazards.

A Wildlife Hazard Assessment is a yearlong ecological study to document wildlife hazards that occur on and near the airport. The objectives of the Wildlife Hazard Assessment were to:

1. Identify the abundance and seasonal movements of potential wildlife hazards.
2. Identify potential wildlife attractants on airport property.
3. Identify the major potential wildlife attractants within five miles of the airport.
4. Analyze past strike history.
5. Make recommendations based on data gathered during the Wildlife Hazard Assessment.

A. Site Description

Frederick Municipal Airport (FDK) is located within the city of Frederick, Frederick County, Maryland. FDK is owned and operated by the City of Frederick. The airport is used for general aviation and also has several aviation related businesses. FDK is host to a fixed-based operator, Signature Flight Support providing aircraft charter and management, aircraft maintenance, and ground services.

Frederick Municipal Airport has 588 acres (238 ha) at an elevation of 303 feet above mean sea level. There are two asphalt runways at FDK; runway 05/23 (5,220 x 100 feet) and runway 12/30 (3,600 x 75 feet).

According to the FAA, for the 12-month period ending April 18th, 2016, the airport had a total of 94,901 operations, an average of 260 per day: 54% local general aviation, 40% transient general aviation, 4% air taxi, and 1% military. At that time there were 190 aircraft based at the airport: 157 single engine, 15 multi-engine, 6 jet airplanes, and 12 helicopters.

There is an air-traffic control tower based on the airfield, operating between the hours of 0700-2100.

B. Events Triggering the Wildlife Hazard Assessment at FDK

According to CFR 139.337, airports must conduct a wildlife hazard assessment when they experience one of more of the following triggering events:

1. An air carrier experiences multiple wildlife strikes.
2. An air carrier aircraft experiences substantial damage from striking wildlife.
3. An air carrier aircraft experiences an engine ingestion of wildlife.
4. Wildlife of a size, or in numbers, capable of causing any of the items described above.

FDK is not a CFR 139.337 certificated airport. FDK has elected to conduct a WHA to maintain safety standards set by the FAA to maintain grant assurances. The WHA will determine what wildlife hazards exist at FDK and what mitigation methods are available to reduce wildlife hazards on the airfield.

C. Review of Strike Database

According to the FAA (FAA 2013) a wildlife strike has occurred when:

1. A pilot reports striking one or more birds or other wildlife;
2. Aircraft maintenance personnel identify aircraft damage as having been caused by a wildlife strike;
3. Personnel on the ground report seeing an aircraft strike 1 or more birds or other wildlife;
4. Bird or other wildlife remains, whether in whole or in part, are found within 200 feet of a runway centerline, unless another reason for the animal's death is identified; and
5. An animal's presence on the airport had a significant negative effect on a flight (i.e., aborted takeoff, aborted landing, high-speed emergency stop, or an aircraft left pavement area to avoid a collision with an animal.

It is estimated that only 40% of all wildlife strikes are reported (Dolbeer 2015). It is important for all airport staff, pilots, and maintenance personnel to report all bird strikes. This information is vital to help reduce the risk of wildlife hazards to aircraft. Please see FAA AC 150-5200/32 current edition for more information on strike reporting.

In the 27 years from 1990 to 2017, the FAA wildlife strike database shows a total of 24 reported strikes FDK (Table 1, Below). Of these strikes, eight strikes occurred with an unknown bird species, five strikes with blackbirds, five strikes with mammals, two strikes with other flocking birds, and a single strike each with small perching birds, columbids, gulls, and waterfowl. Of the blackbirds struck, three strikes occurred with European starlings (*Sturnus vulgaris*). Of the mammals struck, three reports involved white-tailed deer (*Odocoileus virginianus*).

Table 1. Strikes reported at FDK, from FAA Wildlife Strike Database.

Date	Operator	Aircraft	Species	Damage	Cost of Repair	Ingestion	Number Struck
11/11/2015	BUSINESS	MOONEY M20	Unknown bird	N		FALSE	
8/7/2014	UNKNOWN	UNKNOWN	Unknown bird - small			FALSE	1
8/5/2014	UNKNOWN	UNKNOWN	European starling			FALSE	1
6/27/2014	UNKNOWN	C-172	European starling			FALSE	1
6/26/2014	UNKNOWN	UNKNOWN	European starling			FALSE	1
10/25/2013	BUSINESS	HAWKER 900	Microbats	N		TRUE	1

9/4/2013	BUSINESS	CL-601/604	Unknown bird - small	N		FALSE	1
8/28/2013	CHANTILLY AIR	LEARJET-60	Unknown bird - small	N		FALSE	1
7/24/2013	DB AVIATION (NORTHSHORE)	HAWKER-SDLY HS125	Unknown bird - small	S	7500	TRUE	1
4/21/2013	BUSINESS	RKWL CMDR114	Canada goose	M	3000	FALSE	1
12/11/2012	MILITARY	T-6	Brewer's blackbird	N		FALSE	
5/23/2012	MILITARY	T-6	Horned lark	N		FALSE	
1/19/2012	MILITARY	T-6	McCown's longspur	N		FALSE	
10/24/2011	BUSINESS	CIRRUS SR 20/22	White-tailed deer	N		FALSE	1
11/3/2010	GOVERNMENT	AEROS SA365	White-tailed deer	N		FALSE	1
6/10/2010	BUSINESS	PA-44 SEMINOLE	White-tailed deer	M		FALSE	1
3/9/2010	BUSINESS	PA-31 NAVAJO	Red fox	N		FALSE	1
9/24/2008	BRITANNIA AIRWAYS	PA-28	Unknown bird - medium	M?	4200	FALSE	1
9/11/2006	MILITARY	T-37B	Mourning dove	N		FALSE	
8/3/2006	MILITARY	T-37B	Unknown bird - medium	N		FALSE	
7/12/2005	MILITARY	T-6B	Unknown bird - medium	N		FALSE	
5/24/2005	MILITARY	T-37B	Eastern meadowlark	N		FALSE	
4/6/2005	MILITARY	T-37B	Horned lark	N		FALSE	
1/8/1998	BUSINESS	HAWKER-SDLY HS125	Gulls	M	1200	FALSE	2 to 10

Of the strikes that occurred at FDK, 15 strikes reported no damages, a single strike had reported an uncertain amount of damage, three strikes had minor damages and a single strike resulted in substantial damages to the aircraft. Four strike reports did not have an information regarding damage. A total of $15,900 in damages was reported from all strikes occurring at FDK. Two strikes were reported to have caused engine ingestion; one occurring with a microbat and another with an unknown small bird. Only a single strike was reported to occur with 2-10 gulls.

Seasonal variations in strike reports can be interpreted at FDK. Of the 24 strikes reported, an increase in strike reports was shown during the summer months (June-September) (Figure 1). Seasonal factors such as weather, temperature, migration, food availability, and flight operations can influence the potential for strikes to occur on the airfield.

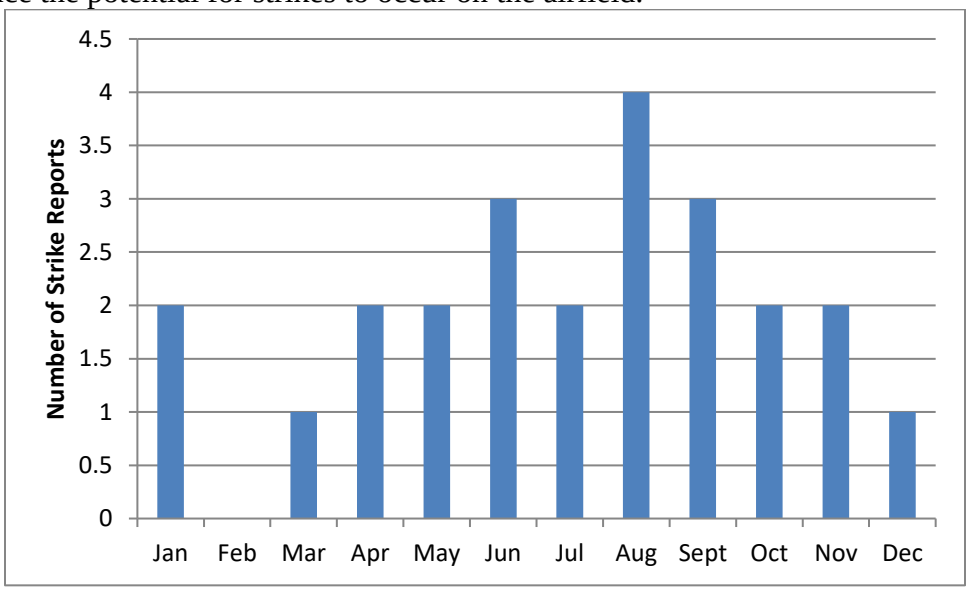


Figure 1. Number of strike reports based on month of occurrence at FDK.

Strikes reported at FDK occurred from ground level up to 2000 feet above ground level (AGL). The majority of strikes occurred at ground level (12 strike reports). Strikes most often occurred while aircraft where on their take-off run (33%) or in the approach phase of flight (29%) (Figure 2). Throughout the 2016-2017 assessment, no strikes were reported to occur on the airfield.

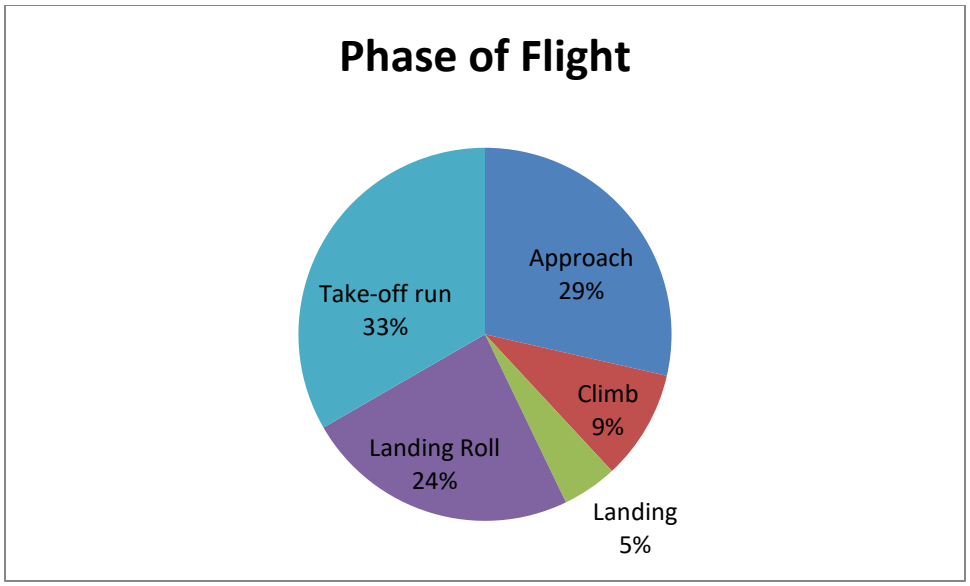


Figure 2. Percentage of strikes reported at FDK by phase of flight.

D. Review of Permits

1. Federal

FDK does not possess a U.S. Fish and Wildlife Service (USFWS) Depredation at Airports permit. This permit would authorize the lethal taking of migratory birds posing health and safety concerns on the airport. This would not authorize the lethal take of any species of bird that are considered Threatened or Endangered, or any bald or golden eagles. This type of permit is viable for 1 calendar year and must be renewed annually. It is recommended that the airport obtain a USFWS Depredation at Airport permit should it become necessary to take migratory birds on the airfield.

2. State

FDK possess a Letter of Authority-Deer, issued by the Maryland Department of Natural Resources. The permit authorizes the lethal take white-tailed deer posing hazard to aircraft on airport property. Deer taken under the permit must be tagged in accordance with the special conditions list on the permit and reported within 24 hours. The permit is valid for a single calendar year. To maintain a current permit, FDK staff will need to reapply at the beginning of each year. A copy of the permit is attached in Appendix A.

E. Threatened and Endangered Species

A list of Maryland's state or federally threatened and endangered bird and mammal species is below (Table 2). The term "endangered" means a species is in danger of extinction throughout all or a significant portion of its range. "Threatened" means a species is likely to become endangered within the foreseeable future.

Table 2. Maryland's state or federally threatened and endangered bird and mammal species (excluding whales).

Birds			
Species	**Scientific Name**	**State Listing**	**Federal Listing**
Northern Goshawk	*Accipiter gentilis*	E	
Short-eared Owl	*Asio flammeus*	E	
Upland Sandpiper	*Bartramia longicauda*	E	
Red Knot	*Calidris canututs rufa*	T	T
Ivory-billed Woodpecker	*Campephillus principalis*	X	E
Piping Plover	*Charadrius melodus*	E	T
Wilson's Plover	*Charadrius wilsonia*	E	
Sedge Wren	*Cistothorus platensis*	E	
Gull-billed Tern	*Gelochelidon nilotica*	E	
Mourning Warbler	*Geothlypis philadelphia*	E	
Loggerhead Shrike	*Lanius ludovicianus*	E	
Black Rail	*Laterallus jamaicensis*	E	
Swainson's Warbler	*Limnothlypis swainsonii*	E	
Eskimo Curlew	*Numenius borealis*	X	LE
Nashville Warbler	*Oreothlypis ruficapilla*	T	
Red-cockaded Woodpecker	*Picoidea borealis*	X	E
Black Skimmer	*Rynchops niger*	E	
Roseate Tern	*Sterna dougallii*	X	E
Common Tern	*Sterna hirundo*	E	
Least Tern	*Sternula antillarum*	T	
Royal Tern	*Thalasseus macimus*	E	

Mammals			
Species	**Scientific Name**	**State Listing**	**Federal Listing**
Gray Wolf	*Canis lupus*	X	E
Eastern Mountain Lion	*Puma concolor couguar*	X	E
Southern Rock Vole	*Microtus chrotorrhinus carolinensis*	E	
Eastern Small-footed Bat	*Myotis leibii*	E	
Northern Long-eared Bat	*Myoitis septentrionalis*	T	T
Indiana Bat	*Myotis sodalis*	E	E
Allegheny Woodrat	*Neotoma magister*	E	
Southern Water Shrew	*Sorex palustris punctulatus*	E	

E-Endangered T-Threatened X-Extirpated

FDK is located in a region where many of these listed species may be found. Wildlife surveys conducted were not meant to look specifically for these species, meaning they could be on or around the airport even if they were not noted during surveys. No species listed as threatened or endangered in Maryland were observed during onsite or offsite surveys at FDK. There is no critical habitat as defined by the United States Fish and Wildlife Service on or near FDK airport.

The airport should familiarize themselves with these species to avoid unlawfully disturbing them during depredation and land management activities. Listed species cannot be harassed or depredated (killed) unless U.S. Fish and Wildlife Service and/or state permits are obtained before doing so. In addition, any habitat changes recommended for this WHA must meet all federal and state criteria for the protection of threatened and endangered species. Any permits required must be obtained prior to habitat changes being made.

F. Current Strategies

Wildlife control techniques are currently used by airport operations personnel. The AOA is patrolled several times daily for wildlife hazards, including both daylight and nighttime patrols. Pyrotechnics and vehicle dispersal are some of the current control practices applied by operations staff. Airport staff also encourages lethal removal of white-tailed deer when necessary to reduce hazards to aircraft. Wildlife mitigation is documented in daily inspection logs.

II. Methods

A. Avian Surveys

Bird surveys were conducted between February 2016 and January 2017 to document the species, number, habitat use and seasonal activity of birds that inhabit the airport. The surveys used a time-area sampling design based on a modified version of the U.S. Fish and Wildlife Service's Breeding Bird Survey (Robbins et al., 1986 & Sutherland et al. 2004). This survey is designed to capture both the temporal (seasonal and diurnal) and spatial use of the airfield by birds as well as behavior/activity, abundance, habitat use, and the overall diversity of species. Surveys were conducted at 14 locations on the airfield, and at 11 off-site locations. Eight surveys were conducted monthly for a total of 12 months. Surveys were conducted during four periods throughout the day: dawn, mid-morning, afternoon and dusk.

Species were grouped based on taxonomical & behavioral characteristics. This approach allows species that are not related to be grouped based on traits most important to wildlife hazard management. Species that exhibit similar traits may respond to similar control methods (Servoss et. al. 2000).

Table 3 shows hazard rankings of birds based on behavioral characteristics. Bird activity and behavior were categorized under the following groups; aerial hunting, flying over observation

area, perched on vegetation, perched on manmade structure, loafing on ground, loafing on water, feeding, on ground on/or adjacent to runway, and flying over runway.

Table 3. Ranking of several types of activity, Sullivan & Baciuska 2005)

Hazard Level	Behavior	Description
Least hazardous	Sitting	Loafing on ground outside of runway
↓	Swimming	Loafing on water
	Feeding	feeding on the ground outside of the runway
	Perching	perched on manmade structure
	Perching	perched on vegetation
	Flyover	flying over the observation area
Most hazardous	Hunting	aerial hunting
	In runway	on ground in or adjacent to runway
	Incursion	Crossing over a runway

In addition, information derived from years of data entered into the FAA National Wildlife Strike Database has allowed wildlife groupings to be assigned values passed on their hazard level to aircraft. This information, shown in Table 4, is invaluable when determining how to expend limited resources when conducting wildlife hazard management activities.

Table 4. Ranking of wildlife based on relative hazard to aircraft. Adopted from FAA AC 150/5200 32-B.

Ranking of 50 Species as to Relative Hazard to Aircraft

(1=most hazardous) based on three criteria (damage, major damage, and effect-on-flight), a composite ranking based on all three rankings (1=most hazardous), and a relative hazard score (100=most hazardous).

Data derived from the FAA National Wildlife Strike Database, January 1990–April 2012

Wildlife species	% of strikes with:			Mean hazard level[4]	Composite ranking	Relative hazard score[5]
	Damage[1]	Major damage[2]	Effect on flight[3]			
White-tailed deer	84	36	46	55	1	100
Snow goose	77	41	39	53	2	95
Turkey vulture	51	19	35	35	3	63
Canada goose	50	17	28	31	4	57
Sandhill crane	41	13	27	27	5	48
Bald eagle	41	12	28	27	6	48
D.-crested cormorant	34	15	24	24	7	44
Mallard	23	9	13	15	8	27
Osprey	22	7	15	15[1]	9	26
Great blue heron	21	6	16	15	10	26
American coot	24	7	11	14	11	25
Coyote	9	2	21	11	12	19
Red-tailed hawk	15	5	11	10	13	19
Cattle egret	10	3	15	9	14	17
Great horned owl	15	3	6	8	15	14
Herring gull	10	5	9	8	16	14
Rock pigeon	10	4	10	8	17	14
Ring-billed gull	8	3	8	6	18	11
American crow	8	3	8	6	18	11
Peregrine falcon	8	2	5	5	20	9
Laughing gull	5	2	7	5	21	8
American robin	7	1	4	4	22	7

1

Snow bunting	1	1	9	4	23	7
Red fox	3	0	8	4	23	7
European starling	4	1	5	3	25	6
Amer. golden-plover	4	2	4	3	26	6
Barn owl	4	2	3	3	27	5
Upland sandpiper	4	1	4	3	27	5
Purple martin	5	1	2	3	29	5
Mourning dove	3	1	4	3	30	5
Red-winged blackbird	3	0	5	3	31	5
Woodchuck	2	0	4	2	32	4
Northern harrier	2	1	2	2	33	3
Chimney swift	2	0	2	1	34	2
Killdeer	1	0	2	1	35	2
House sparrow	2	0	1	1	35	2
Blk-tailed jackrabbit	1	1	1	1	37	2
American kestrel	1	<1	2	1	38	2
Eastern meadowlark	1	<1	2	1	38	2
S.-tailed flycatcher	0	0	2	1	40	1
Horned lark	1	<1	1	1	41	1
Pacific golden-plover	1	0	1	1	41	1
Barn swallow	1	0	1	1	43	1
Savannah sparrow	1	0	<1	1	43	1
Common nighthawk	1	0	1	1	45	1
Tree swallow	0	0	1	<1	46	1
Burrowing owl	1	0	0	<1	46	1
Western kingbird	0	0	1	<1	48	0
Virginia opossum	1	0	0	<1	48	0
Striped skunk	0	0	0	0	50	0

B. Survey Locations

Statistics from the FAA Wildlife Strike Birdstrike Database show 94% of strikes occur on or near airports while the aircraft is landing, circling or taking off (Dolbeer et al. 2009). Approximately 72% of bird strikes occur at or below 500 feet AGL, and 92% occur at or below 3500 feet AGL. For these reasons, offsite survey locations were selected based on their proximity to the airport and the potential for the areas to be attractive to wildlife.

1. Onsite Survey Locations

Onsite survey points (site 1-7) were selected to allow for monitoring of the entire AOA on the airfield. Please see Appendix B for a map overview of the onsite survey points. Site-specific recommendations noted in the survey point descriptions below are discussed in greater detail in Chapter IV, Summary of Recommendations.

Onsite Survey Point 1

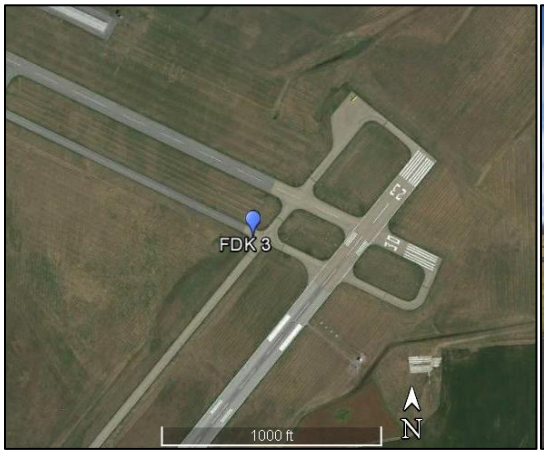
Survey Point 1 is located at 39°25'20.68"N 77°22'46.99"W. The survey point is located on the west end of Taxiway Bravo, overlooking the approach of Runway 12. The survey point is surrounded by maintained fields, with mature trees bordering the Monocacy River to the north. West, across Monocacy Blvd. is a small farm with silo. Occasional flocks of rock doves would be observed on and around the farm property. The Maryland State Police hangar is located near the end of Taxiway Bravo. This hangar has small flocks of European starlings perching on and around it throughout the assessment.

Onsite Survey Point 2

Survey Point 2 is located at 39º25’15.82”N 77º22’32.55”W. The survey point was located at the intersection of Taxiways Bravo and Foxtrot, overlooking the mid-section of Runway 12/30. The area was surrounded by maintained fields, with building on the north side of the Runway. Moderate sized flocks of blackbirds were observed loafing within the maintained fields around the Runway and infield south of Taxiway Bravo.

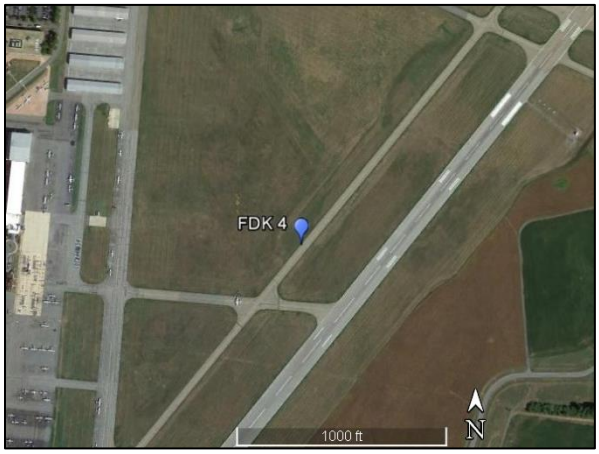
Onsite Survey Point 3

Survey Point 3 is located at 39º25’9.88”N 77º22’17.14”W. The survey point was located at the intersections of Taxiways Alpha and Bravo, overlooking the intersections of Runways 05/23 and 12/30. The area is surrounded by maintained fields, with a small drainage ditch running parallel with Taxiway Alpha. Another drainage ditch can be viewed from this site, located west of Runway 05/23. In addition, agricultural corn fields are located west of the Runway.



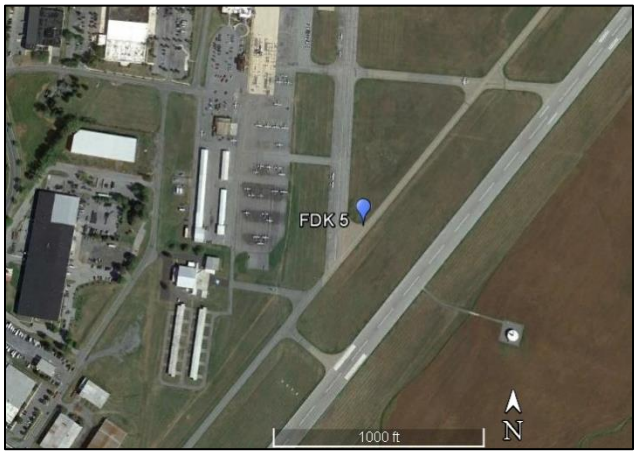
Onsite Survey Point 4

Survey Point 4 is located at 39º24’58.98”N 77º22’28.71”W. The survey point is located on Taxiway Alpha, just north of Taxiway Echo overlooking the mid-section of Runway 05/23. The area is surrounded by maintained fields, with agricultural corn fields west of Runway 05/23. European starlings and horned larks (*Eremophila alpestris*) were the two most abundant birds recorded near this location.



Onsite Survey Point 5

Survey Point 5 is located at 39º24’49.24”N 77º22’39.48”W. The survey point is located at the intersection of Taxiways Alpha and Charlie, overlooking the mid-section of Runway 05/23. To the east is the main ramp including several hangars and parked aircraft. Blackbirds were most abundant at this survey points throughout the assessment. Blackbirds were often observed loafing within the short-maintained grasses and perching on various buildings/structures near the main ramp.

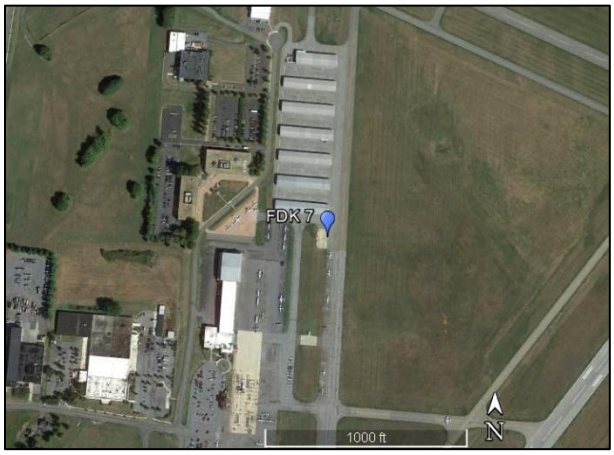


Onsite Survey Point 6

Survey Point 6 is located at 39º24’36.92”N 77º22’52.75”W. The survey point was located on the south end of Taxiway Alpha, overlooking the approach of Runway 05. An abandoned storage buildings east of the taxiway had been removed during the assessment. The dominant habitat surrounding the survey point including maintained fields, with a drainage ditch located on the west side of the runway. European starlings were the predominant species recorded from the survey point.

Onsite Survey Point 7

Survey Point 7 is located at 39o25’5.25”N 77o22’40.03”W. The survey point is located on Taxiway Charlie, south of Taxiway Bravo. The area overlooks the maintained grasses within the infield to the east, and several hangars and aircraft parking to the west. Overall bird counts were relatively low compared to other onsite survey points. European starlings where the most abundant species observed.



2. Offsite Survey Locations

Offsite survey locations (Sites 8-11) (shown in Appendix C) were selected to monitor avian populations up to 5 nautical miles around the airport. Sites were selected based on their attractiveness to hazardous wildlife populations, as discussed in FAA Advisory Circular 150/5200 33 current edition. Survey site selection was also based upon the area's location in reference to aircraft movement patterns surrounding FDK. Recommendations regarding wildlife management at offsite locations are discussed in greater detail in Chapter IV, Summary of Recommendations.

Offsite Survey Point 8

Offsite Survey Point 8 is located at 39°24'59.19"N 77°19'33.60" W, 2.30 miles east of the airport. This survey point was located on the western dam of Lake Linganore. Lake Linganore is a man-made water body surrounded by several residential villages and forested habitat. Overall bird observations were relatively low throughout the assessment. No large flocks of waterfowl were observed on the lake.

Offsite Survey Point 9

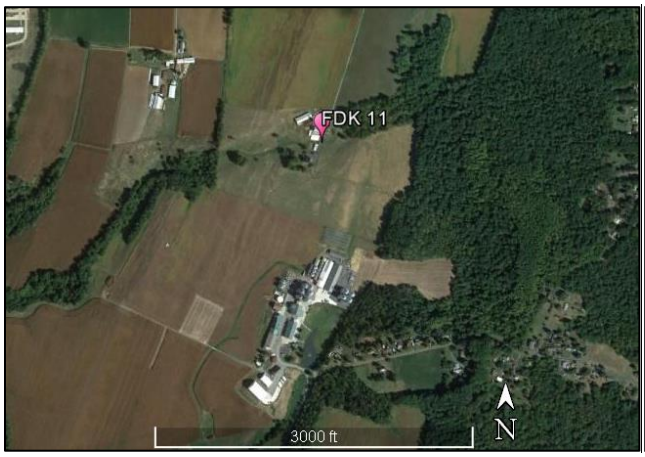
Offsite survey point 9 is located at 39º26’1.92”N 77º22’16.05”W, 0.75 miles north of the airfield. The survey point overlooks the Clustered Spires Golf Course, which is separated from airport property by the Monocacy River. Blackbirds were the most commonly observed guild on property, with a few counts of waterfowl recorded on the golf course’s pond

Offsite Survey Point 10

Offsite survey point 10 is located at 39º 22’34.86”N 88º20’32.27”W, 2.95 miles southeast of the airfield. The survey point overlooks the eastern edge of County of Frederick Solid Waste Facility. Blackbirds, specifically European starlings were the most abundant birds on the property. Flocks remained relatively small throughout the assessment, with a single observation of a flock 3000+ during September.

Offsite Survey Point 11

Offsite survey point 11 is located at 39o25’43.98”N 77o21’3.10”W, 1.0 miles northeast of the airfield. The survey point overlooks a local farm and grain silos. Agricultural fields and cattle operations can serve as an attractant to variety of bird species. Small perching birds and blackbirds were the two most abundant guilds observed on and around the farm. European starlings and house sparrows were the predominant species recorded foraging within agricultural fields and perching on buildings at the farm.



III. Results

A. Onsite Avian Surveys

A total of 4,310 individual birds of 36 different species were recorded during onsite surveys at FDK (Table 5, Page 27). European starlings (3,436 individuals) were the most abundant species recorded. Based solely on individuals, blackbirds (83%), other flocking (7%), and waterfowl (4%) where the most abundant guilds recorded at FDK.

1. Behavior

Bird behaviors can pose various levels of hazard to aircraft on the airfield. The most frequent behavior exhibited by birds during onsite survey was loafing on the ground (Figure 3). Loafing behaviors are not directly hazardous to aircraft; however, when birds are loafing near runways and taxiways, they have the potential to be startled by passing aircraft. Additional behaviors that high numbers of birds were observed performing included: perching on structures and flying over the survey point. Flying behaviors pose a direct hazard to aircraft, especially when crossing runways. The number of birds crossing the runway per survey minute throughout the assessment was 0.65 (Based on 658 birds recorded flying over runway, three minuet surveys, seven survey points, four surveys per month for 12 months).

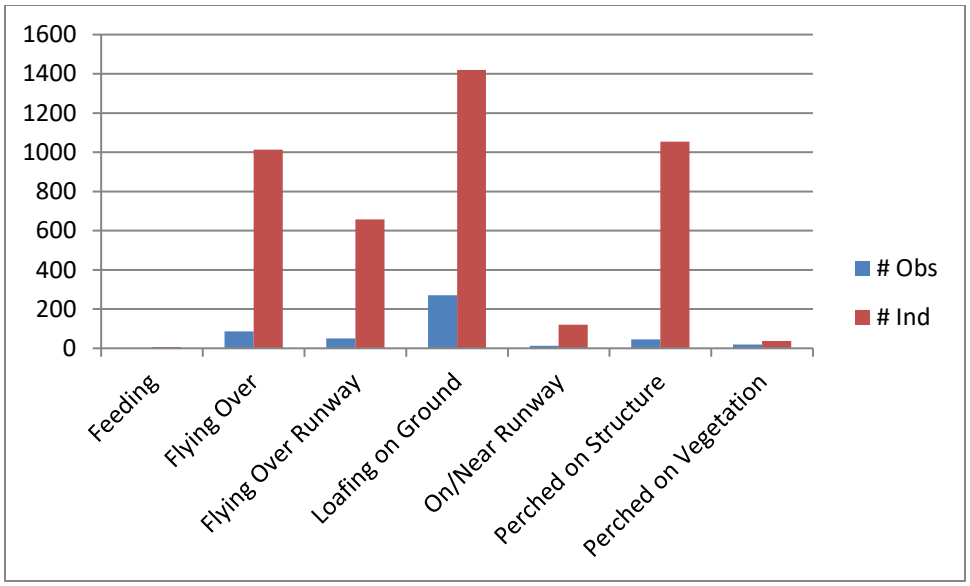


Figure 3. Total number of observations and individual birds for each behavior category during onsite surveys at FDK.

Bird behavior can also vary depending on the time of day. During the middle of the day, a greater percentage of the total birds recorded where loafing on the ground (Figure 4). At dawn, a greater percentage of the total birds were perched on structures and flying over. At dusk, increased percentages of birds were flying over the survey point and runway. FDK staff should be aware of fluctuations in bird movements around the airfield throughout the day.

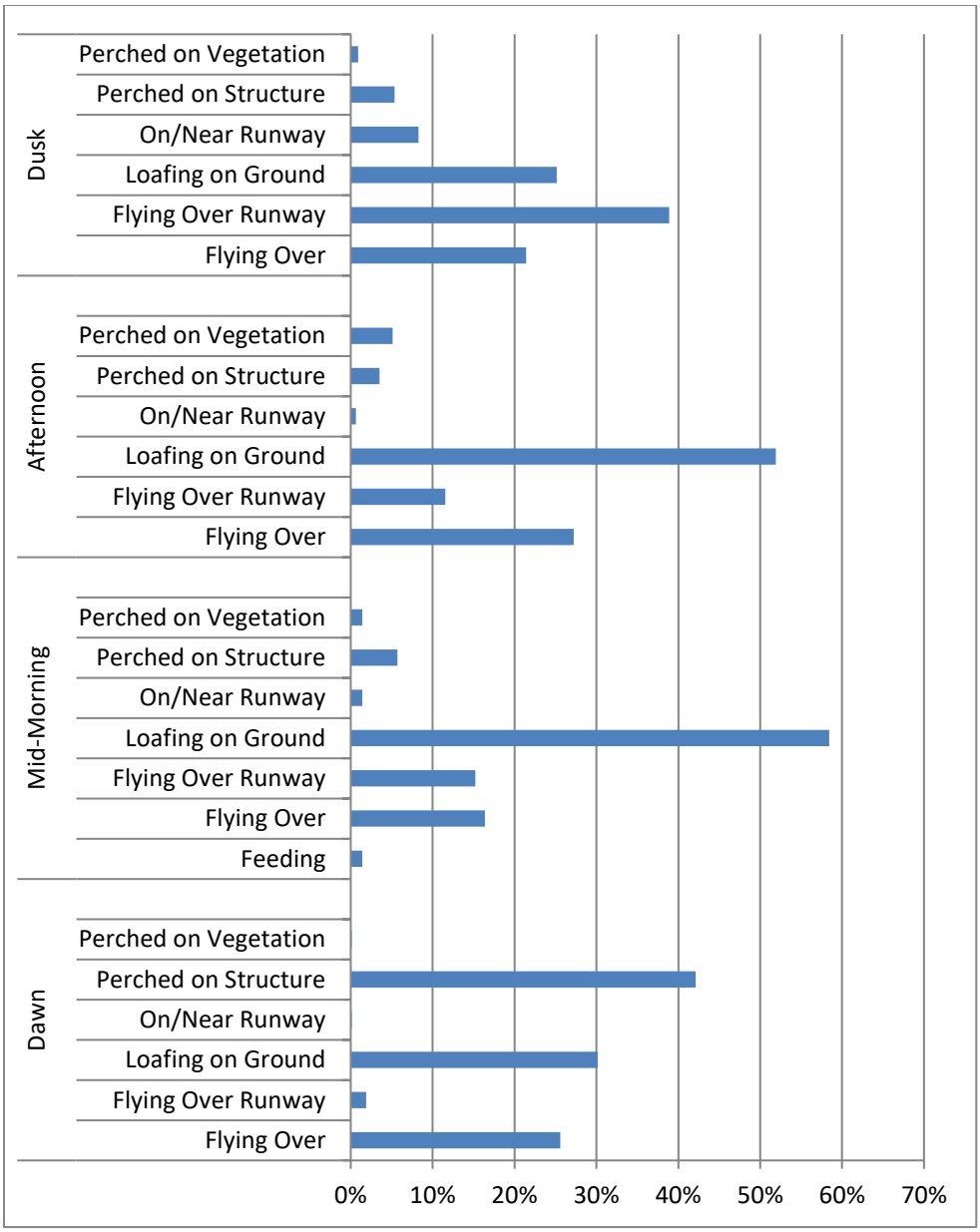


Figure 4. Percentage of individual birds for each behavior category by time of day.

2. Habitat Use

Bird presence on the airfield greatly varied between survey points (Figure 5). Bird counts were the greatest at onsite survey points #1 and #5. Increased bird counts at these survey points were predominantly due to European starlings perching on structures. Starlings will often take quarry within buildings and hangars for roosting and nesting. During the assessment, abandoned storage buildings located east of survey point #5 was removed, decreasing the available habitat for starlings.

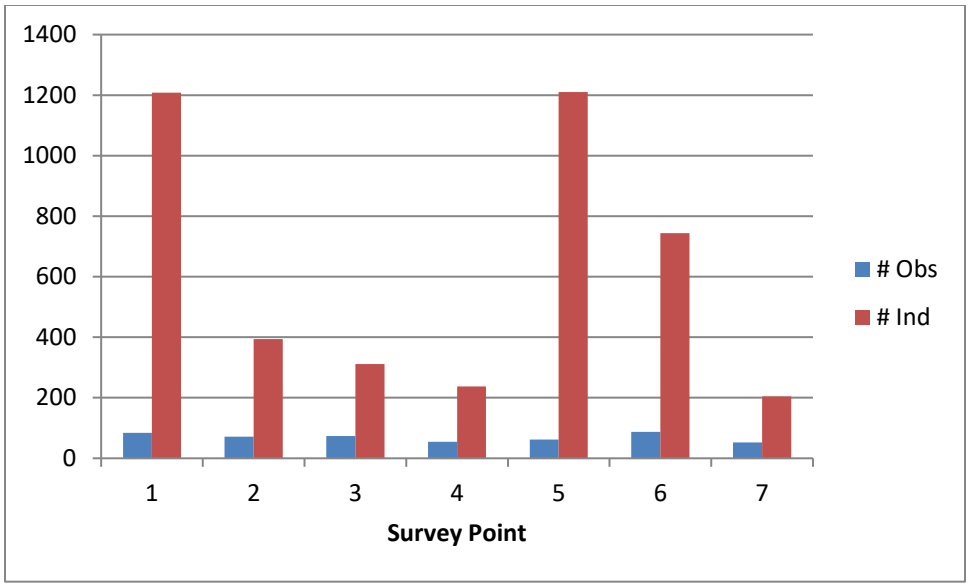


Figure 5. Total number of observations and individual birds at each onsite survey point at FDK.

Habitat types on the airfield can cause various attractions to wildlife. During the assessment, the greatest number of birds was recorded within variable, maintained field and pavement habitats (Figure 6). Variable habitats is described as when wildlife are transitioning between two areas, such as going from maintained field, over pavement to an edge area. Maintained fields are the mowed portions of the airfield. Grass composition and height can greatly affect the overall attraction to birds. Pavement areas are often sought out by birds to loaf and forage for "grit".

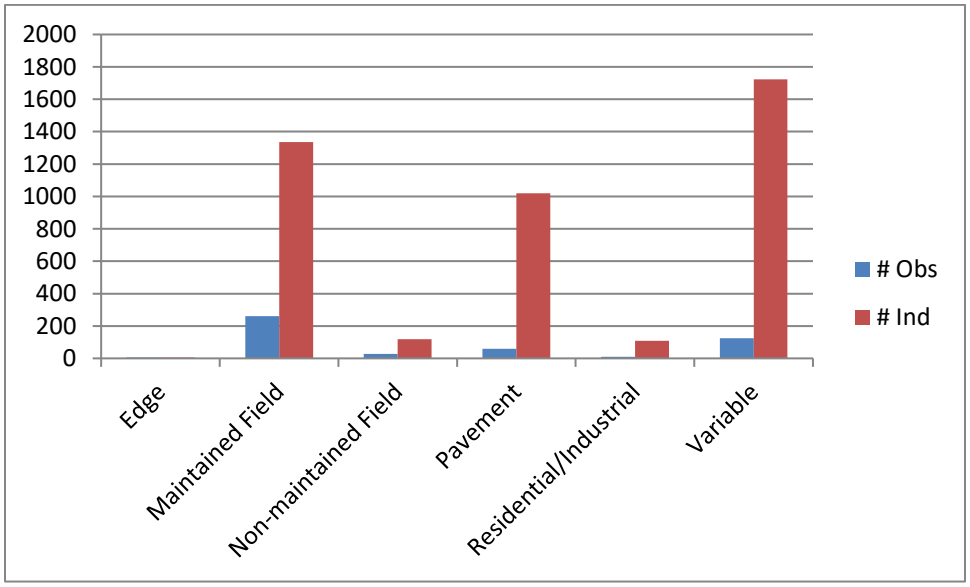


Figure 6. Total number of observations and individual birds within each habitat type at FDK.

3. Seasonal Activity

Changes in the seasons throughout the year can also have an impact on the amount of birds in the vicinity of the airport. Bird abundance varied month to month at FDK, with peaks in birds recorded in May, July-August, October, and December (Figure 7). An increase in bird abundance during the spring is likely due to seasonal migrants making their way back to their nesting grounds. Elevated counts during the summer months may be associated with newly fledged juveniles out foraging with adults for the first time. In addition, food abundance (seeds and insects) can also increase during the summer months. Into the fall, bird will begin forming migratory flocks to travel south towards warmer climates and greater food sources. In the winter, local flocks of birds that are overwintering around FDK are likely seeking out available food sources. Airfields can provide overwintering birds potential food sources within the maintained fields.

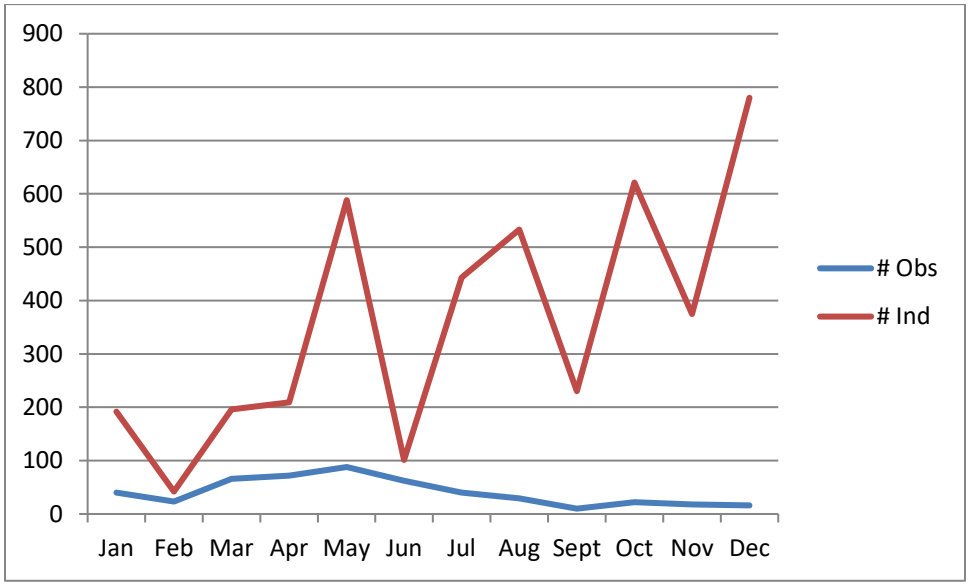


Figure 7. Total number of observations and individual birds for each month during onsite surveys at FDK.

4. Daily Activity

Bird activity can vary throughout each day. During onsite surveys, bird counts were the greatest at dawn and dusk (Figure 8). Typical bird activity peaks during dawn and dusk. Many birds will maximize their activity during the coolest time of day (dawn) (Aschoff 1966). This allows them to conserve water and reduce the danger of heat stress (Wolf and Walsberg 1996). Their activity will then decline throughout the day as they find shelter from the heat and digest their food (Wolf and Walsberg 1996). FDK staff should be aware of increased bird presence on the airfield and increase observations and harassments during periods when birds are likely to be more active.

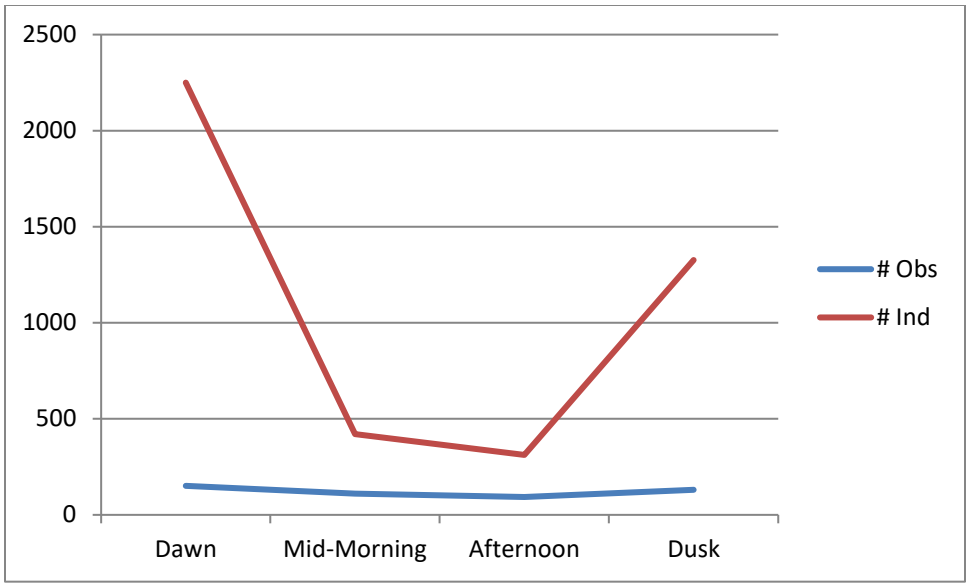


Figure 8. Total number of observations and individual birds by time of day at FDK.

5. Guild/Species Presence

A total of 4,310 individuals of 36 different species of birds were recorded during onsite surveys at FDK. Based on total observations recorded during onsite surveys, blackbirds (39%), other flocking (30%), and small perching birds (13%) were the 1st, 2nd, and 3rd most commonly recored guilds (Figure 9). Based on total individuals, blackbirds (83%), other flocking (7%), and waterfowl (4%) were the most abudannt guilds recorded (Figure 10). Blackbirds were mostly comprised of observaitons of European starlings (3,436 individuals). Other species of birds of birds recorded in high numbers at FDK included: horned lark (*Eremophila alpestris*, 202 individuals), killdeer (*Chardrius vociferus*, 48 individuals), savvanah sparrow (*Passerculus sandwichensis*), 51 individuals), and Canada geese (*Branta canadensis*, 174 individuals).

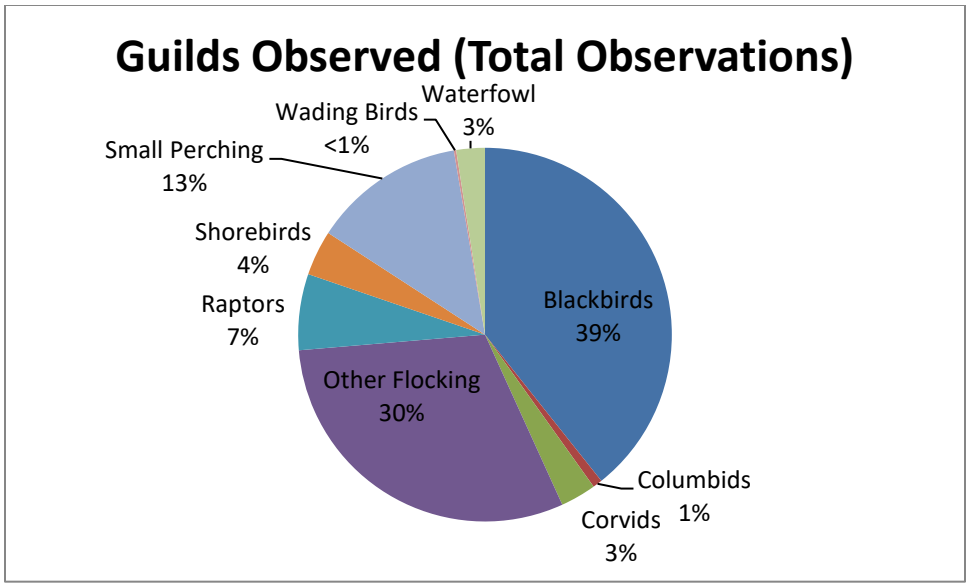


Figure 9. Percentage of guilds observed based during onsite surveys at FDK based on total observations.

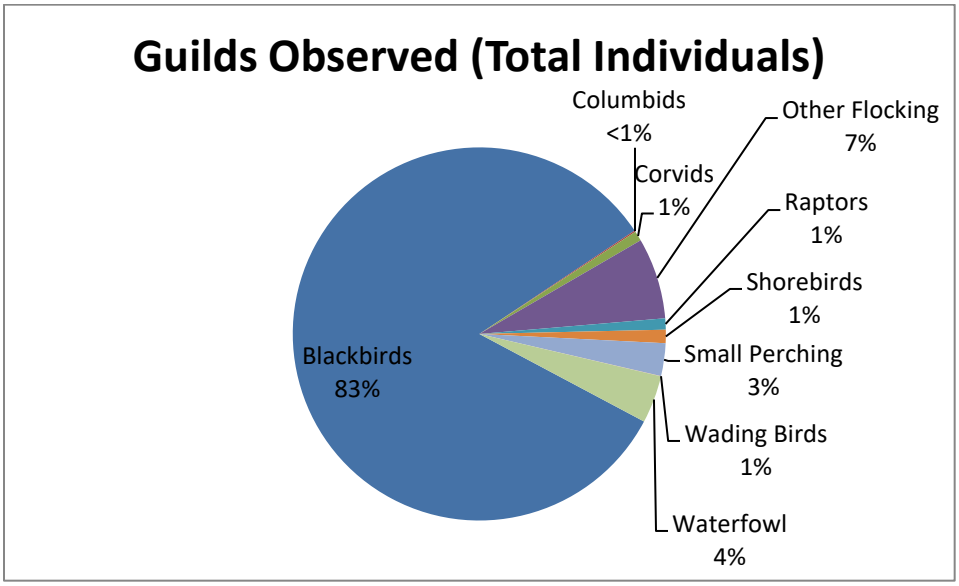


Figure 10. Percentage of guilds observed during onsite surveys at FDK based on total individuals.

Table 5. Guild, species and total number of birds recorded during onsite surveys at FDK.

Blackbirds	**3572**	**Shorebirds**	**50**
Brown-headed Cowbird	1	Killdeer	48
Bobolink	1	Upland Sandpiper	2
Common Grackle	31	**Small Perching**	**122**
Eastern Meadowlark	93	American Goldfinch	14
European Starling	3436	Gray Catbird	1
Red-winged Blackbird	10	House Finch	1
Columbids	**5**	House Sparrow	40
Mourning Dove	4	Indigo Bunting	1
Rock Dove	1	Northern Cardinal	1
Corvids	**37**	Northern Mockingbird	8
American Crow	37	Red-bellied Woodpecker	1
Other Flocking	**303**	Savannah Sparrow	51
American Robin	25	Song Sparrow	4
Barn Swallow	49	**Wading Birds**	**1**
Chimney Swift	21	Great Blue Heron	1
Horned Lark	202	**Waterfowl**	**178**
Snow Bunting	4	Canada Goose	174
Tree Swallow	2	Mallard	4
Raptors	**42**		
American Kestrel	6		
Black Vulture	2		
Northern Harrier	1		
Red-tailed Hawk	3		
Sharp-shinned Hawk	1		
Turkey Vulture	29		

a. Waterfowl

Canada Goose

Waterfowl are considered the most hazardous birds to aviation because of their large body size and tendency to form flocks. A collision with a member of this guild is more likely to cause damage to an aircraft. Sources of open water and agriculture are the greatest attractions to waterfowl on the airport. Waterfowl are attracted to these areas because the open water provides a safe refuge. They can escape mammalian predators by swimming away from the shore. Wetland habitat also provides areas where these birds can forage for food. Waterfowl can also be attracted to agricultural areas where they can feed on grains from crops. Waterfowl accounted for 3% of the total observations and 4% of the total individual birds recorded during onsite surveys. A total of two species of waterfowl were recorded at FDK, including: Canada geese (174 individuals) and mallards (*Anas platyrhynchos*, 4

individuals). Canada geese are a large bodied bird, weight between 4-15 pounds, with a wing span of 50-66 inches. Canada geese are found throughout the majority of North America. Over the last few decades, populations of Canada geese have stopped migrating and have become stagnant residents, breeding and overwintering in the same locations. The residential populations of Canada geese pose a significant hazard to aircraft throughout the entire year and not just during periods of migrations. Canada geese are ranked the 4th most hazardous species to aircraft (FAA AC 150/5200 32B).

Overall, waterfowl abundance remained relatively low throughout the assessment, with flock sizes varying between 1-75 individuals. Geese abundance was the greatest during the months of August and September (Figure 11). Elevated counts of waterfowl during these months are likely due to local flocks beginning to concentrate with the onset of migration. During the fall, many migratory flocks of waterfowl will begin performing their seasonal migration, headed south towards warmer climates and greater food sources. An additional small peak of waterfowl was recorded during January surveys. These observations of waterfowl were of flocks moving around Frederick, MD n search of food sources. FDK should be aware of seasonal variances in waterfowl abundance on and around the airfield.

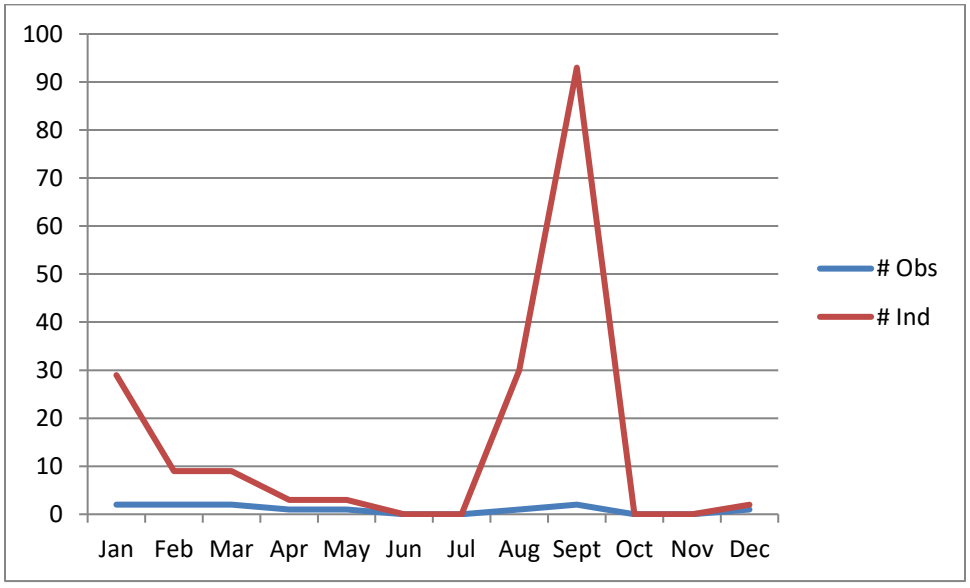


Figure 11. Total number of observations and individual waterfowl for each month during onsite surveys at FDK.

Waterfowl observations on the airfield were the greatest near onsite survey point #1 (Figure 12). The greatest numbers of waterfowl were observed near onsite survey points #1 and #3. Increases in waterfowl near approach and departure paths of runways can increase the hazards posed to aircraft, especially if the waterfowl are observed in flight.

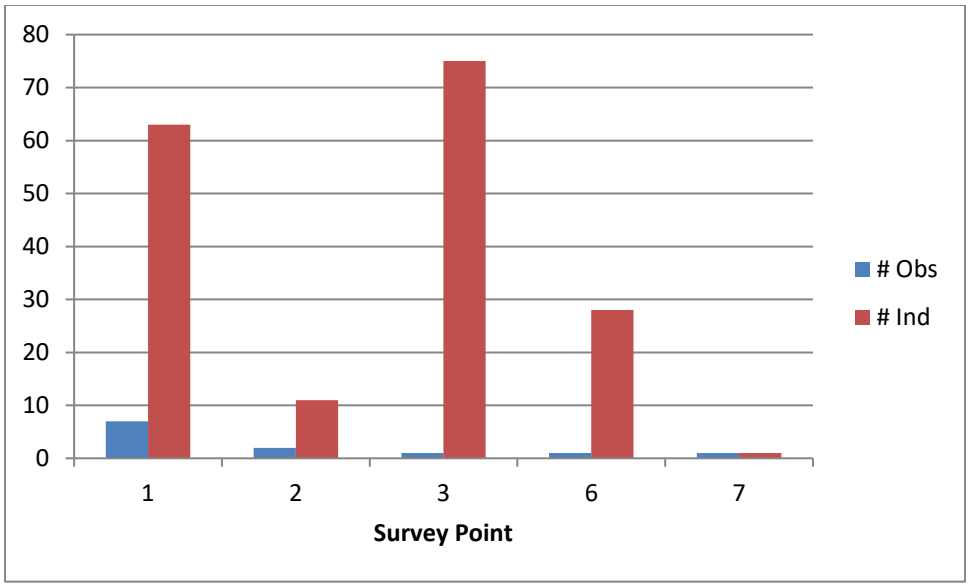


Figure 12. Total number of observations and individual waterfowl near each onsite survey point at FDK.

Waterfowl recorded during onsite surveys were most often observed loafing on or near the runway and flying over the survey point (Figure 13). Hazards posed to aircraft significant increase when birds are on or near runways. The large number of waterfowl recorded on or near the runway occurred near onsite survey point #3, when a flock of 75 Canada geese were loafing on the edge of the pavement. FDK staff should support a zero tolerance policy for Canada geese on airport property. Any flocks of geese observed should be immediately hazed from the area. If necessary, FDK staff should reinforce non-lethal harassment with lethal control after obtaining a USFWS Depredation at Airport permit.

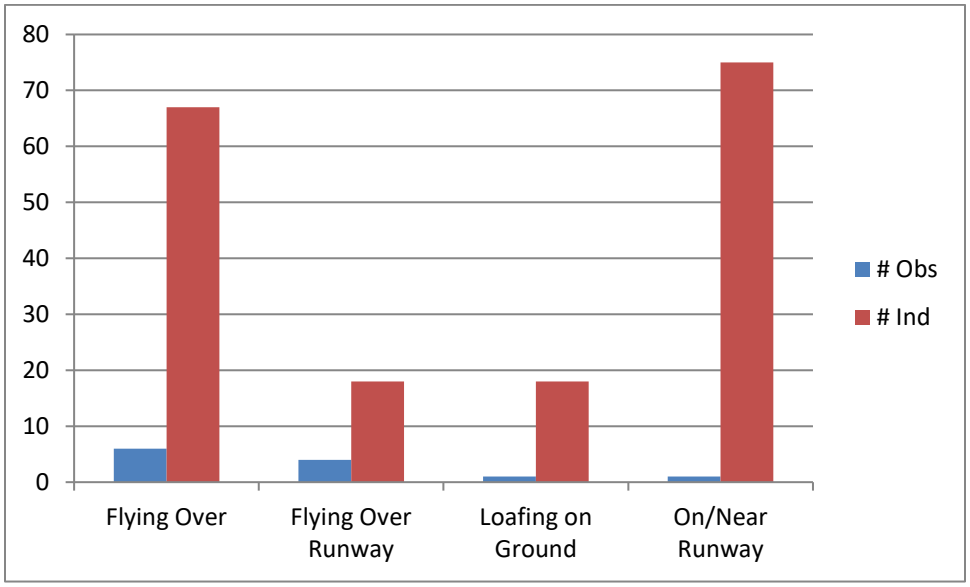


Figure 13. Total number of observations and individual waterfowl for each behavior category during onsite surveys at FDK.

b. Gulls

Ring-billed gull

Gulls are another bird guild that is highly dangerous to aircraft for similar reasons as waterfowl; they have a strong tendency to form flocks and have large bodies. Gulls can be attracted to any source of open water near an airport where they can forage, hydrate, or loaf on the water. They can also be attracted to the airport by a food source. Gulls will feed on earthworms that emerge after precipitation events, exposed refuse, or insects in the airport grass. No gull species were recorded during onsite surveys at FDK. Due to the absence of gulls, FDK staff should not underestimate their potential for occurrence on the field. FDK staff should continue to monitor the airfield for gulls and take appropriate actions to haze them from the field should they be observed.

c. Blackbirds

European Starling

Blackbirds can pose a potentially serious threat to aviation because of their tendency to form and move in flocks. European starlings have been responsible for the most wildlife-related plane crashes resulting in casualties (Cleary and Dolbeer 2005). Blackbirds were the most commonly observed guild and most abundant guild recorded during onsite surveys (39% of total observations, 83% of the total individuals). A total of six species of blackbirds were recorded during onsite surveys, including: brown-headed cowbird (*Molothrus ater*, 1 individual), bobolink (*Dolichonyx oryzivorus*, 1 individual), common grackle (*Quisicalus quiscula*, 31 individuals), eastern meadowlark (*Sturnus magna*,93 individuals), European starling (3,436 individuals), and red-winged blackbird (*Agelaius phoeniceus*, 10 individuals) (Table 5). European starlings are small bodied blackbirds, weighing between 2-4 ounces. European starlings are ranked the 25th most hazardous species to aviation safety due to their flocking tendencies (FAA AC 150/5200 32B). European starlings are an invasive species, introduced to North America in the late 1800s. Since their introduction, they have rapidly spread throughout all of the lower 48 states. Blackbirds are frequently attracted to the airport by food sources. They feed primarily on invertebrates on the airport turf. They can also be attracted to roosting sites provided by trees or dense brushy vegetation. Invertebrates in the soil can potentially be reduced by pesticides applied to the airfield. Reducing this food source will have the potential to reduce blackbird numbers on the field. Roost sites can be found in dense vegetation and airport buildings. Roosting can be discouraged by installing anti-perching devices and using various forms of harassment techniques.

Blackbird abundance varied throughout the year, with a gradual increase in abundance occurring through summer, into the fall and winter (Figure 14). Blackbirds will often form large flocks around prevalent food sources. When seasonal changes reduce the amount of food availability, flocks will increase in size around attracting feeding areas. Overall, blackbirds were highly

prevalent on the FDK airfield due to abundant food items, perching locations and nesting locations.

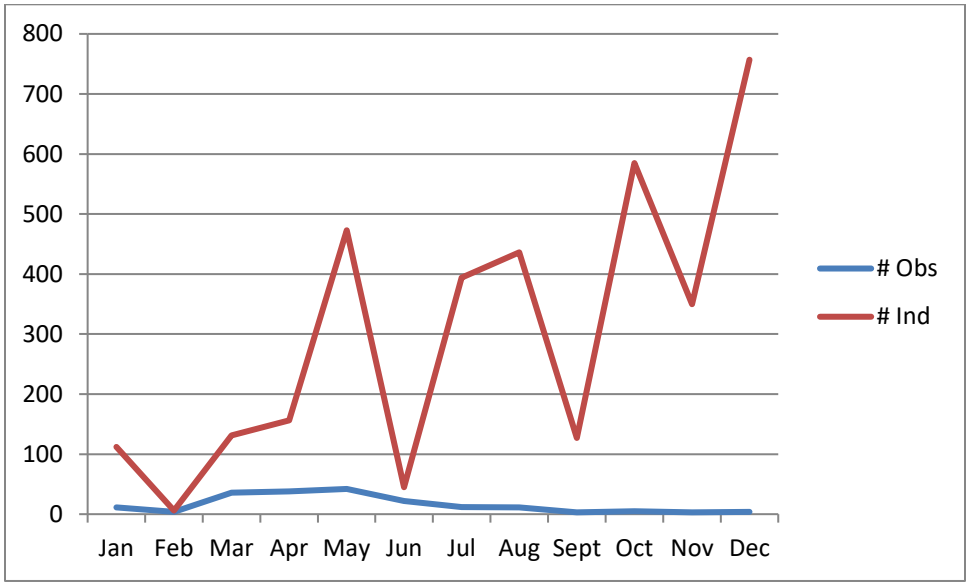


Figure 14. Total number of observations and individual blackbirds for each month during onsite surveys at FDK.

Blackbirds were commonly observed at all onsite survey points on the airfield. The greatest numbers were recorded near onsite survey points #1 and #5 (Figure 15). Both of these locations attracted high counts of European starlings due to abundant perching locations and nesting locations. Throughout the assessment, abandoned storage buildings were removed from the southern side of the main ramp. The buildings had several access points allowing starlings to roost and nest within the structure. Since its removal, many of the starlings had relocated off the airfield and near the Maryland State Police Hangar. FDK staff should inspect the Maryland State Police Hangar for access points for starlings. Any areas where starlings can gain access should be closed off.

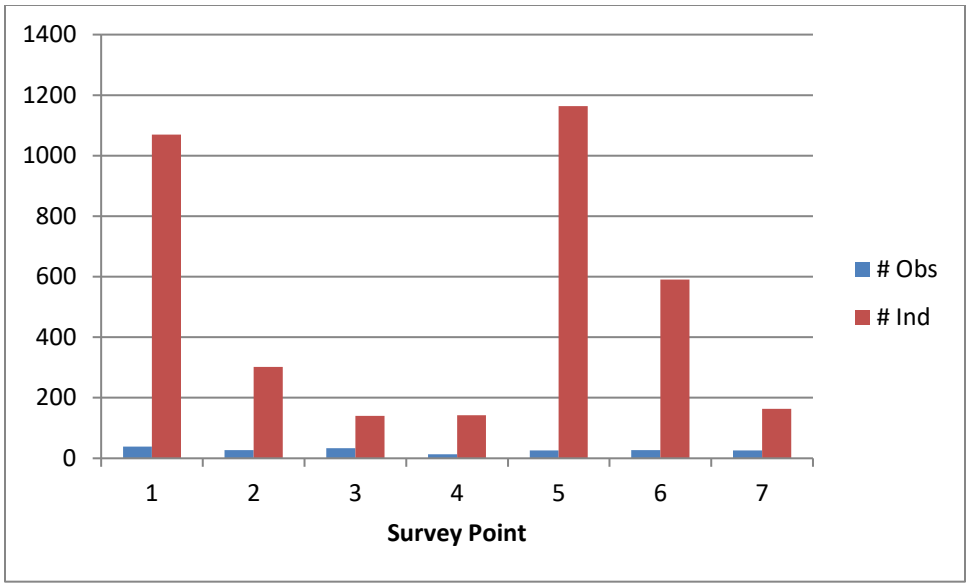


Figure 15. Total number of observations and individual blackbirds recorded near each onsite survey point at FDK.

Blackbirds were recorded exhibiting a variety of behaviors on the FDK property (Figure 16). Increased counts were recorded flying over the survey point, flying over the runway, loafing on the ground and perching on structure. The greatest hazards posed to aircraft are when blackbirds are in flight, especially when traveling over the runway. Given the abundance of European starlings on the airfield, FDK should investigate the starting a starling population control program on the airfield. Airfield staff should obtain and deploy starling traps on the airfield. Traps should be utilized during months when increased flock sizes are present on the field.

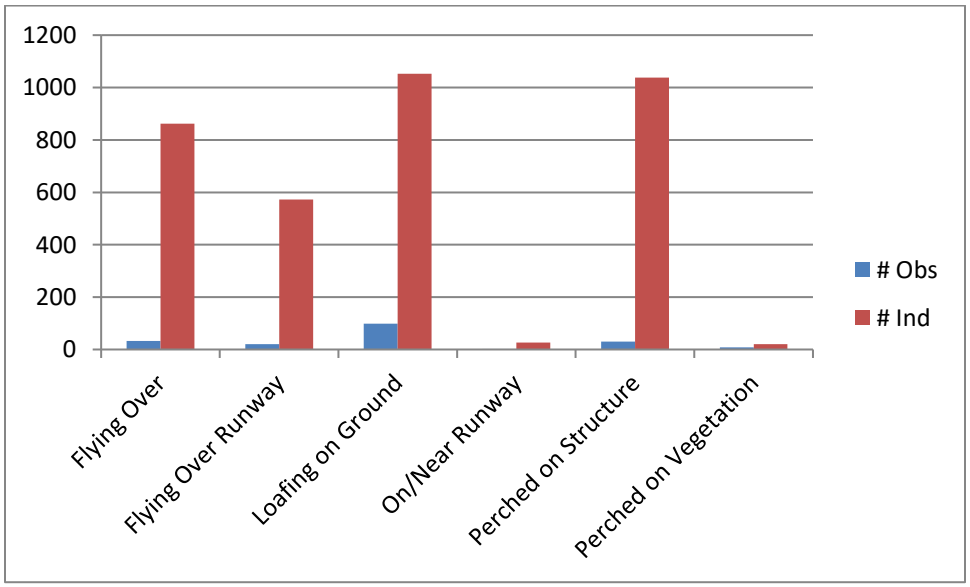


Figure 16. Total number of observations and individual blackbirds for each behavior category during onsite surveys at FDK

d. Raptors

Turkey Vulture

Vultures and other raptors can be attracted to airports for several reasons. Vultures can be attracted to animal carcasses and solid waste disposal bins on or near the airport. Airport staff should remove any animal carcasses on/near the airport and keep all food waste in covered containers. Garbage receptacles at the airport should be inspected for proper covering. Other raptors can be attracted to small mammals in vegetated areas of the airport. Raptors can also be attracted to perches on the airport that allow them to observe prey from an elevated position. The large areas of open ground and concrete also heat up faster than many of the areas around the airport. This differential heating creates columns of rising air that these birds can use to soar and gain altitude without using large amounts of energy. Raptors accounted for 7% of the total observations and 1% of the total individuals recorded during onsite surveys. A total of 42 individuals of 6 different species were recorded (Table 5). Turkey vultures (*Cathartes aura*) were the most commonly observed raptor species at FDK. Turkey vultures are a large bodied bird, weighing between 4-5 pounds and have a wingspan up to 70 inches. Due to their body size, flocking tendencies and flight characteristics, they pose a significant hazard to aviation. They are ranked the 3rd most hazardous species by the FAA (FAA AC 150-5200 32 B).

Raptor abundance varied throughout the assessment, with peaks in raptors recorded during January and October (Figure 17). Overall, raptors remained relatively low in abundance compared to other guilds recorded during the assessment. The moderate peaks recorded during January and October was due to a small flock of turkey vultures observed flying over the airfield. FDK staff should be aware that migratory flocks of raptors can increase the abundance on and around the airfield.

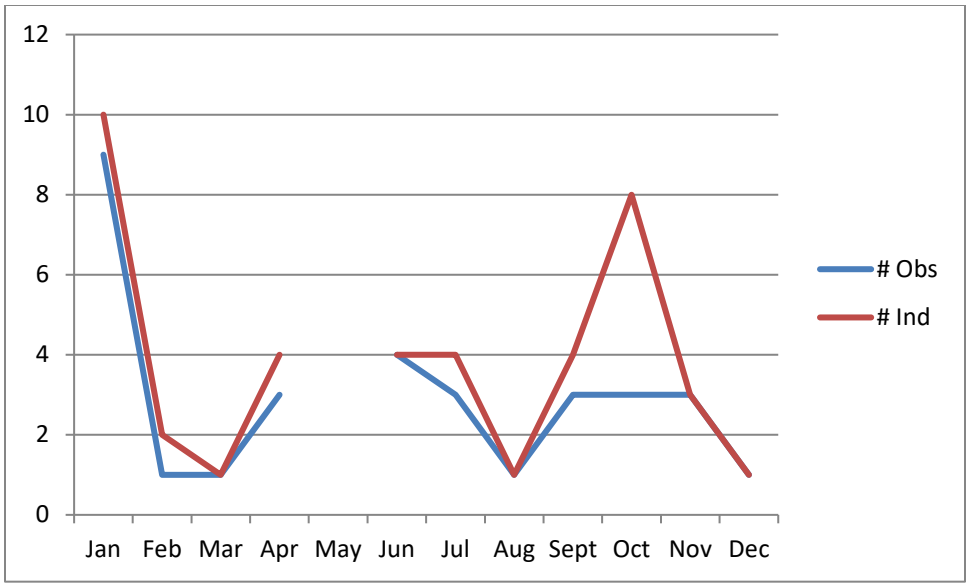


Figure 17. Total number of observations and individual raptors for each month during onsite surveys.

Raptors observed during onsite surveys were evenly distributed across the airfield, with no significant attraction to specific areas of the airfield (Figure 18). Onsite survey point #4 had the greatest overall counts of raptors recorded, which was primarily due to a small flock of turkey vultures observed flying over the airfield. Raptors in flight can pose a significant hazard to aircraft, especially when their flight paths cross the runway, or their soaring behaviors are within the approach and departure paths of the runway. FDK staff should be vigilant to haze any raptors observed using the airfield. FDK staff should also communicate with the local DOT, to ensure that animals struck by vehicles around the airfield are collected and disposed of as soon as possible.

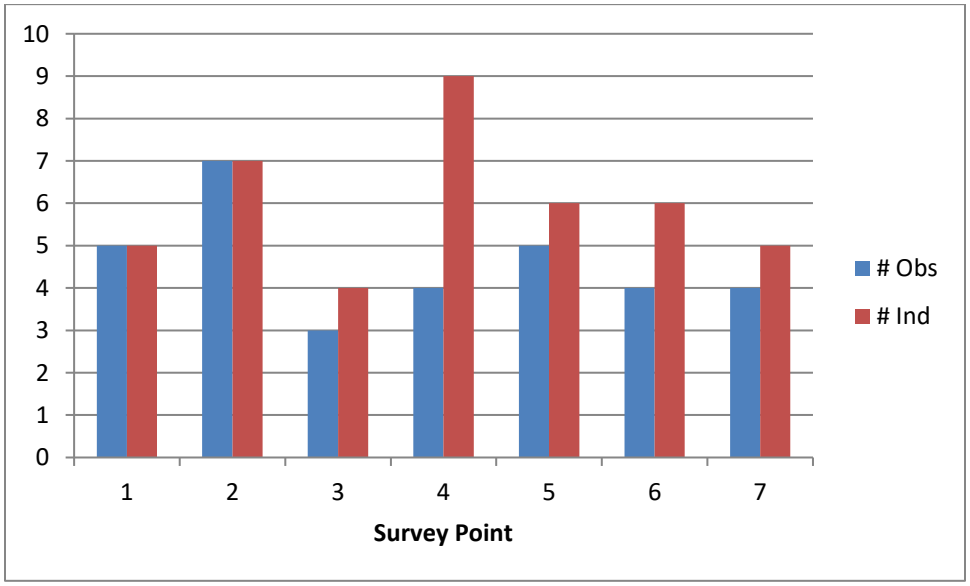


Figure 18. Total number of observations and individual raptors near each onsite survey point at FDK.

Raptors recorded during onsite surveys where most often observed flying over the runway or survey point (Figure 19). These two behaviors can pose the greatest hazards to aircraft. Raptors recorded in flight were at a mean altitude of 130 feet AGL, with observations of raptors up to 500 feet AGL. Due to their large body size and soaring habits, FDK should implement a zero-tolerance policy for turkey vultures and black vultures (*Coragyps atratus*). Increased harassments with lethal reinforcement can help reduce the frequency of raptors coming to the airfield.

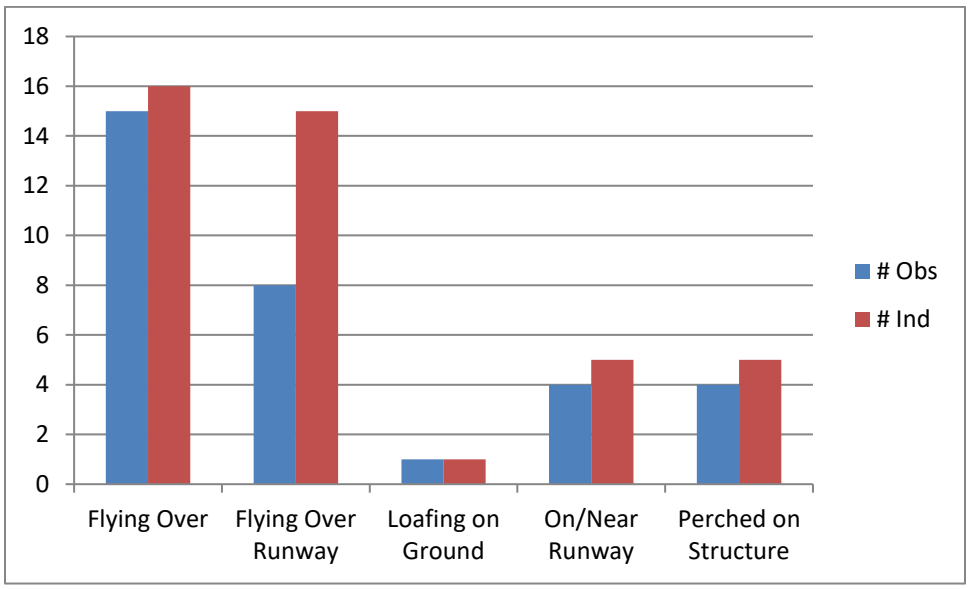


Figure 19. Total number of observations and individual raptors for each behavior category during onsite surveys.

e. Columbids

Mourning Dove

Columbids (doves) are a potentially hazardous bird to aviation because they frequently form large flocks. This behavior increases the likelihood that a collision with wildlife will involve multiple strikes on the aircraft. According to 25 years of strike data (1990-2014) submitted to the FAA Strike Database , pigeons and doves account for 14% of all reported strikes submitted to the FAA and 17% of strikes with >1 animal (Dolbeer et. al 2015). They are frequently attracted to airports by grasses that produce large seeds. Columbids can also be attracted to roosting sites in wooded areas on/near the airport. Columbids will also utilize hangars that have the doors left open as roosting and nesting sites. Columbids accounted for 1% of the total observations and <1% of the total individuals recorded during onsite surveys. Overall a total of four mourning doves (*Zenaida macroura*) and a single rock dove (*Columba livia*) were documented at FDK (Table 5). Mourning doves are a medium bodied bird, weighing between 3.4-6 ounces and have a wingspan up to 18 inches. Mourning doves are ranked the 30th most hazardous species to aviation (FAA AC 150-5200 32 B).

Columbids were recorded during February (1individual), April (2 individuals), August (1 individual), and October (1 individual). The greatest counts of columbids (3 individuals) were recorded near onsite survey point #7. Columbids can be attracted to buildings and hangars on the airfield due to potential roosting and nesting sites. Throughout the assessment, Loomacres staff did not observe any nesting locations for columbids within or around the hangars. FDK staff should continue to monitor the airfield for potential nesting sites within hangars. Airport tenants should be encouraged to maintain their hangars to reduce potential nesting sites.

f. Wading Birds

Great Blue Heron

Wading birds are large-bodied birds that have long, slender legs and necks. This guild of birds can be attracted to any open water source on an airport where they can feed. Many species of wading birds will also feed on insects, amphibians, retiles and small mammals in vegetated areas of the airport. Wading birds accounted for <1% of the total observations and 1% of the total individuals recorded during onsite surveys. A single great blue heron (*Ardea herodias*) was recorded at FDK (Table 5). Great blue herons are large bodied birds, weighing up to 5.5 pounds and have a wingspan around 65 inches. Great blue herons are ranked the 10th most hazardous species to aircraft (FAA AC 150/5200 32B).

The single heron was recorded during April near onsite survey point #1. The heron was recorded flying over the airfield, headed north towards the Monocacy River. The FDK airfield is not highly attractive to wading bird due to the absence of standing water on the property. However, due to the close proximity of the Monocacy River, wading birds can pose a hazard to aircraft when traveling to and from the area. FDK staff should be observant for wading birds flying over the property. Due to their large body size and slow flight characteristics, they can pose a significant hazard to aircraft. When possible, FDK staff should conduct non-lethal harassments of wading birds flying over the property. These harassments can encourage wading birds to take alternative flight paths to and from the river, reducing the potential of the birds crossing flight paths.

g. Shorebirds

Killdeer

Shorebirds have a very similar biology to wading birds. These birds range greatly in size and can be very large birds with the potential to cause severe damage in the event of a collision. Shorebirds are frequently attracted to aquatic habitats; however, several species will frequent open grassland habitats. Shorebirds accounted for 4% of the total observations and 1% of the total individuals recorded during onsite surveys at FDK. A total of 50 individuals of two species were recorded including: killdeer

(*Chardrius vociferus*, 50 individuals), and upland sandpiper (*Bartramia longicauda*, 2 individuals) (Table 5). Killdeer are medium sized shorebirds weighing approximately 2.6 -4.5 ounces. They forage on the ground for insects as their primary food source. They can be identified by the two distinctive black rings around their necks. Killdeer will also feign having a broken wing as a nest defense strategy. When a perceived threat nears the nest the adult will move away from the nest while flapping its wing at an odd angle in an attempt to draw the predator away. If this behavior is observed on the airport, there is a killdeer nest nearby. Killdeer are ranked the 35th most hazardous species to aviation by the FAA (FAA AC 150/5200 32 B).

Shorebirds were recorded in the greatest numbers during August (Figure 20). Shorebird species such as killdeer will often seek out open grassland habitats to nest and forage. These local populations are present around FDK during the spring, summer and fall. During the winter, these species will perform a migration southwards towards warmer climates and greater food sources. The large spike in shorebirds abundance during August is likely due to a migratory flock being its fall migration. These migratory flocks will then seek out attractive habitats to rest and refuel before continuing migration.

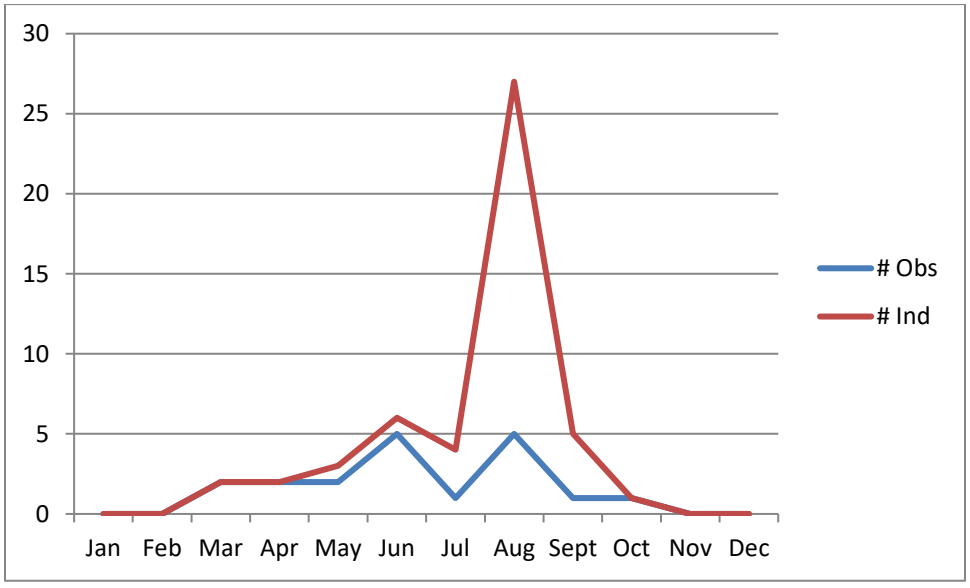


Figure 20. Total number of observations and individual shorebirds for each month during onsite surveys at FDK.

Shorebirds recorded during onsite surveys were most abundant near onsite survey points #4 and #6 (Figure 21). These locations were attractive to shorebirds such as killdeer, due to the presence of short-maintained grasses and exposed gravel areas. Concentrations of shorebirds near the movement areas of the airfield can increase the potential for a strike. FDK staff should monitor all movement areas for loafing shorebirds and take appropriate actions to disperse them from the airfield. Lethal reinforcement can assist in dissuading shorebirds from concentration on FDK property.

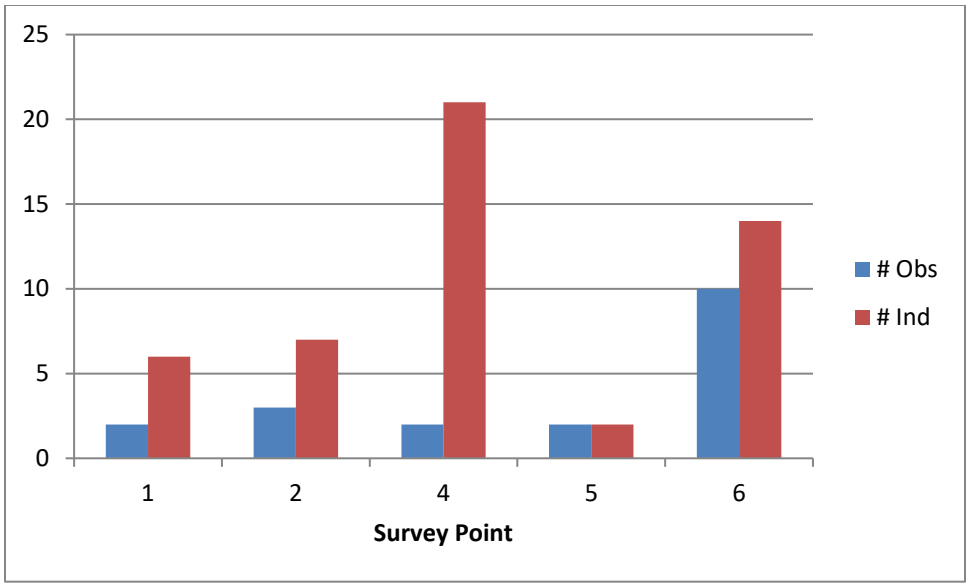


Figure 21. Total number of observations and individual shorebirds near each onsite survey point at FDK.

Shorebirds recorded during onsite surveys at FDK were most often observed loafing of the ground (Figure 24). This behavior is not inherently hazardous to aircraft when the birds are located away from taxiways and runways; however, when birds are loafing near movement areas, they can become startled by passing aircraft and flush into the moving plane. Abundant counts of shorebirds loafing on the property also indicate that the flocks of killdeer should be more regularly harassed from the property.

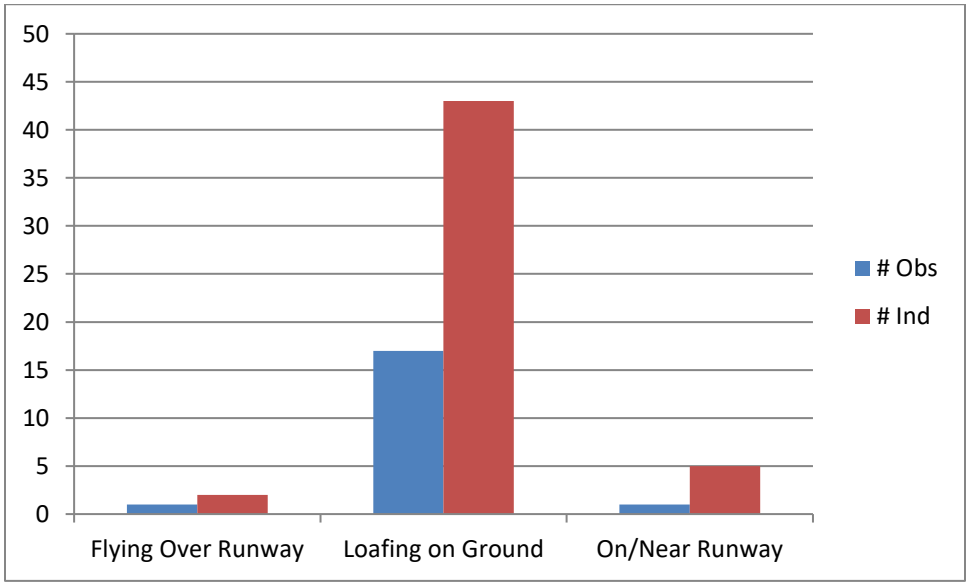


Figure 22. Total number of observations and individual shorebirds for each behavior category during onsite surveys at FDK.

h. Corvids

American Crow

Corvids are highly omnivorous and opportunistic, and are attracted by a wide variety of food sources. Corvids can be attracted to an airport by food sources including exposed food waste and uncovered trash containers. They can also be attracted to the grassy areas of the airport by a food source such as earthworms forced above ground by a precipitation event. Corivds accounted for 3% of the total observations and 1% of the total individuals recorded during onsite surveys at FDK. American crows were the sole species of corvid recorded at FDK (37 individuals) (Table 5).). American crows are a common species found throughout the majority of North America. American crows are a medium bodied bird, ranging 11-21 ounces and have a wing span of 33-39 inches. Depending on the time of the year, American crows are typically observed in small to moderate sized flocks. However, during winter months, American crows often form communal roosts that can number in the 10,000s. They are ranked 18th most hazardous species to aviation (FAA AC 150-5200 32 B).

American crows were most abundant between March-May (Figure 23). An increase in American crows on the airfield is likely associated with local flocks seeking out potential food sources. Overall, corvids were not regularly observed on the airfield during the assessment. Flock sizes varied between 1-10 individuals. FDK staff should be vigilant to harass any flocks of crows observed on the property.

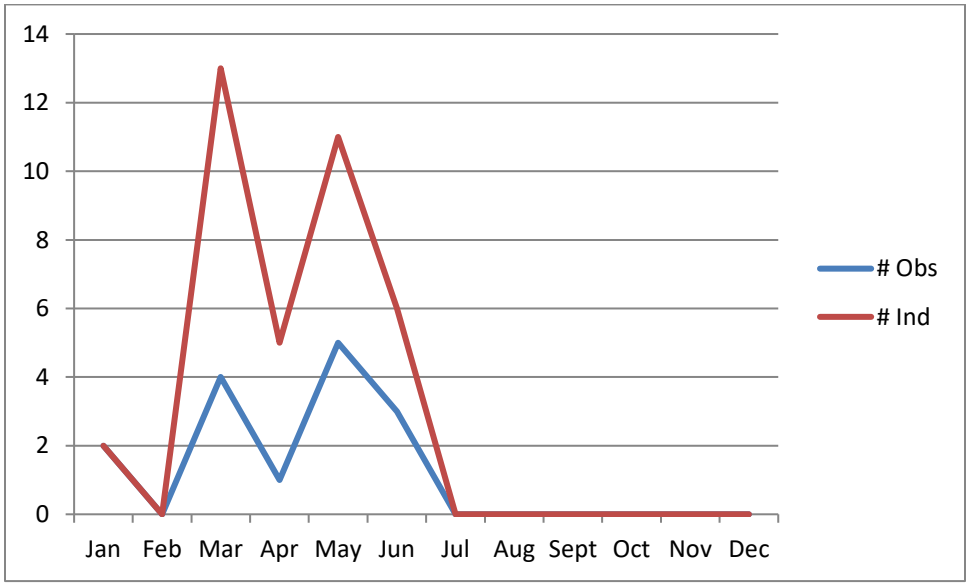


Figure 23. Total number of observations and individual corvids for each month during onsite surveys at FDK.

When present on FDK, corvids were recorded in the greatest counts near onsite survey point #6 (Figure 24). American crows observed near this survey point were most often flying over the area or perching on trees and wires on the edge of Bucheimer Rd. FDK staff should be vigilant to haze any flocks of corivds attempting to use the airfield. Non-lethal harassment should be reinforced with lethal control when necessary.

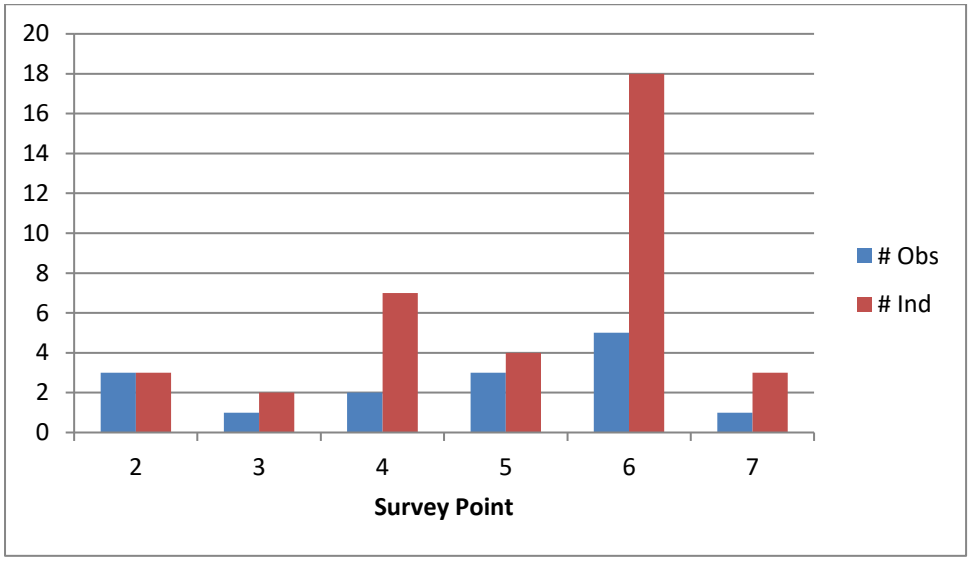


Figure 24. Total number of observations and individual corivds near each onsite survey point at FDK.

Corvids recorded during onsite surveys were most often observed flying over the survey point or the runway (Figure 25). These behaviors are considered to pose the greatest hazards to aircraft. Corvids were recorded at varying altitudes, with the average observation of corvids in flight at 87 feet AGL, and the highest observation at 200 feet AGL.

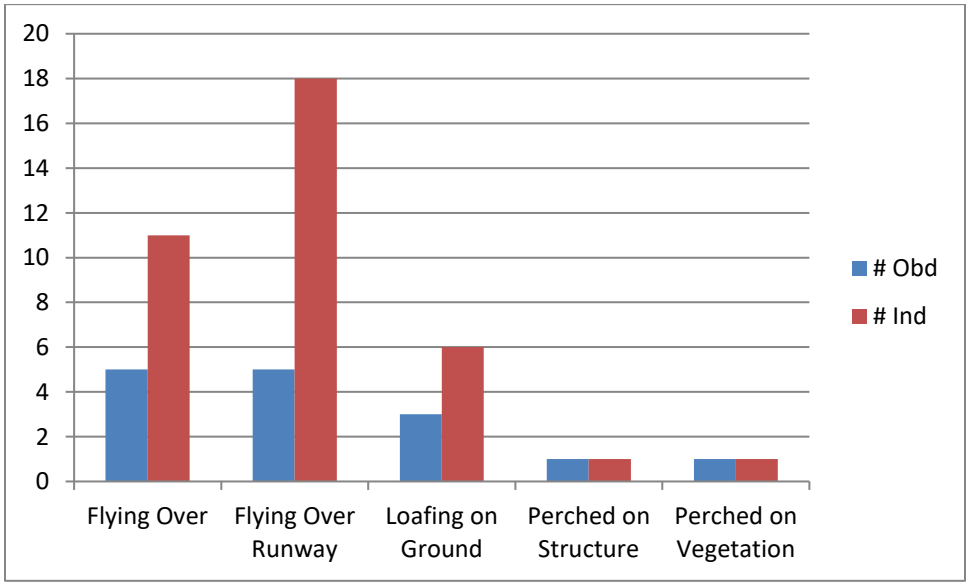


Figure 25. Total number of observations and individual corvids for each behavior category during onsite surveys.

i. Gallinaceous Birds

Gallinaceous birds are heavily bodied birds that spend a large portion of their time on the ground. They are typically not strong fliers. Gallinaceous birds are often listed as state game species, which are protected by state regulations. No gallinaceous birds were observed during onsite surveys. However, wild turkeys (*Meleagris gallopavo*) could be present in the area. Airport staff should have a zero tolerance policy if wild turkeys are observed on the airfield. They can be dispersed with pyrotechnics or lethally removed.

Wild Turkey

j. Other Flocking Birds

Horned Lark

Members of the guild "other flocking birds" have the potential to pose a serious threat to aviation. This is due to their habit of forming large flocks during migration and feeding. These birds can be attracted to airports by food sources (often insects or fruit) and roosting/nesting areas. Other flocking birds accounted for 30% of the total observations and 7% of the total individuals recorded during onsite surveys at FDK. A total of 303 individuals of six different species were recorded (Table 5). The most abundant and commonly observed other flocking bird at FDK was horned larks (202 individuals). Horned larks are a small bodied bird, weighing around 1.0 ounces and have a wingspan up to 12 inches. Horned larks are attracted to open barren and grassland habitats, where they forage on seeds from the ground. Due to their commonality on airfields and flocking tendencies, they are ranked the 41st most hazardous species to aviation (FAA AC 150/5200 32B).

Other flocking bird abundance had varied at FDK throughout the assessment, with a peak in abundance during the winter and spring (Figure 26). The horned lark was observed on FDK property throughout the year. Other species of other flocking birds such as barn swallows (*Hirundo rustica*), are only present on the airfield during the spring, summer and fall. Swallows will perform a seasonal migration south to overwinter in warmer climates with greater food sources. FDK staff should beware in seasonal fluctuations in other flocking bird abundance on and around the airfield.

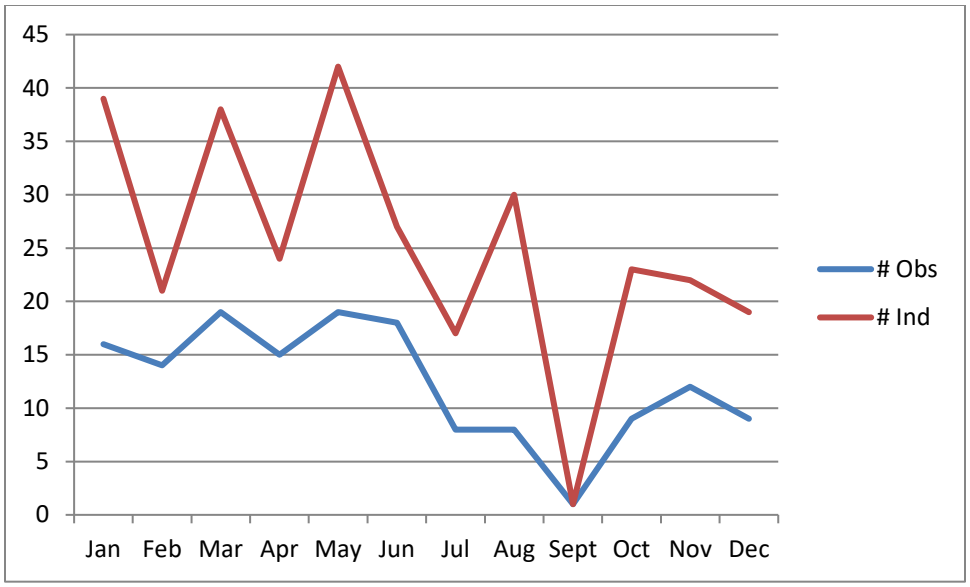


Figure 26. Total number of observations and individual other flocking birds for each month during onsite surveys at FDK.

Other flocking birds were recorded near all onsite survey points at FDK, with the greatest counts near onsite point #6 (Figure 27). Horned larks were the most commonly observed species of other flocking birds near onsite survey point #6. Horned larks were often observed loafing within the short maintained grasses and along the taxiway. On movement areas, horned larks can pose a significant hazard to aircraft. Although small; the potential for causing damage to an aircraft can increase when horned larks are in moderate sized flocks.

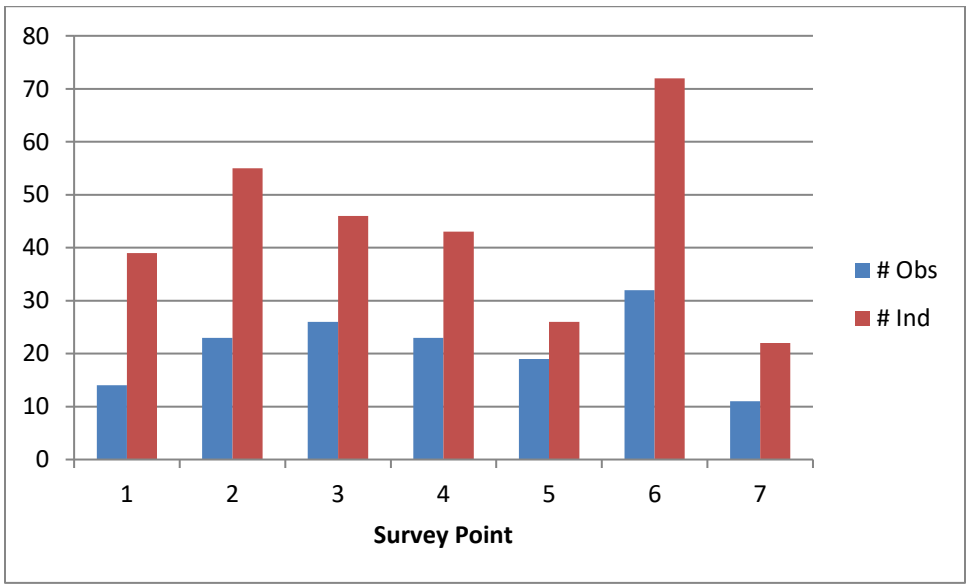


Figure 27. Total number of observations and individual other flocking birds near each onsite survey point at FDK.

Other flocking birds recorded during onsite surveys were most often observed loafing on the ground (Figure 28). These behaviors are not inherently hazardous to aircraft unless near taxiways and runways. These behaviors are most commonly exhibited by horned larks, as they will forage and loaf on the ground.

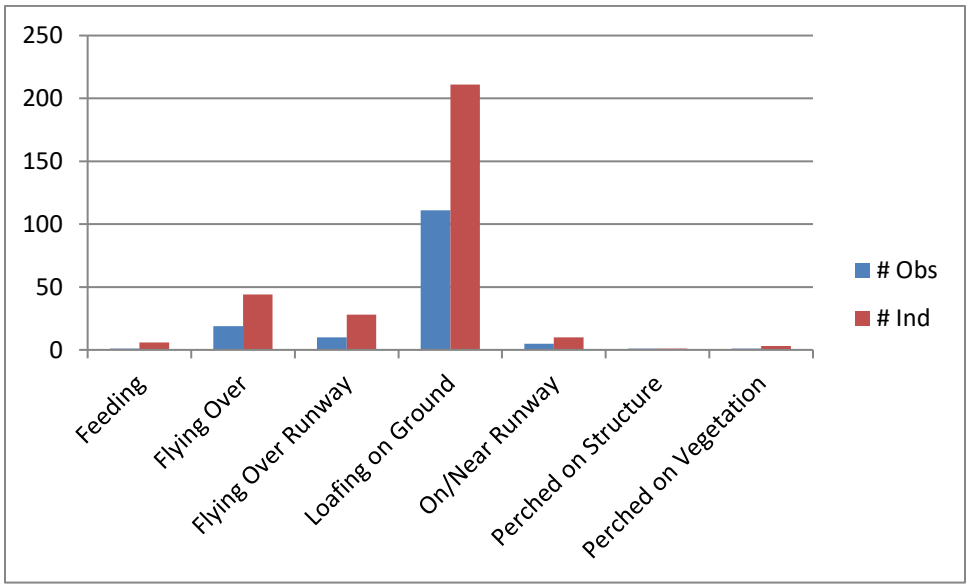


Figure 28. Total number of observations and individual other flocking birds for each behavior category during onsite surveys at FDK.

k. Small Perching Birds

House Sparrow

Small perching birds are the least hazardous guild of birds at an airport for several reasons. They are the smallest birds and are therefore likely to have the lowest impact forces on an aircraft during a bird strike. However, engine ingestions and other collisions with these birds still have the potential to damage aircraft. Small perching birds may become a hazard at airports during the migratory season. These birds have the potential to form flocks that can result in multiple wildlife strikes, increasing the danger during a collision. Many small perching birds also favor woodland habitat and are less abundant in an airport environment. Some small perching birds like the savannah sparrow (*Passerculus sandwichensis*) do prefer open grasslands and are commonly found on airports. Small perching birds accounted for 13% of the total observations and 3% of the total individuals recorded during onsite surveys at FDK. A total of 122 individuals of 10 different species were recorded. Savannah sparrows (51 individuals) and house sparrows (*Passer domesticus*, 40 individuals) were the two most abundant small perching birds recorded during onsite surveys. House sparrows are an exotic species introduced to North America. They are small bodied, weighing around 1.0 ounces and a wingspan up to 10 inches. House sparrows are common

species on airfield, attracted to buildings and structures. They are a cavity nesting species, taking quarry within man-made and natural voids.

Small perching birds were most abundant during May surveys (Figure 29). A large increase in small perching birds during the spring is likely due to migratory flocks making their way back to their breeding grounds. During the spring, many species of small perching bird will begin establishing breeding territories and nesting sites. At this time, the males of many species will begin perching and calling for females around their nest sites. These behaviors allow for easier detection and can give cause for such a dramatic increase in total individuals.

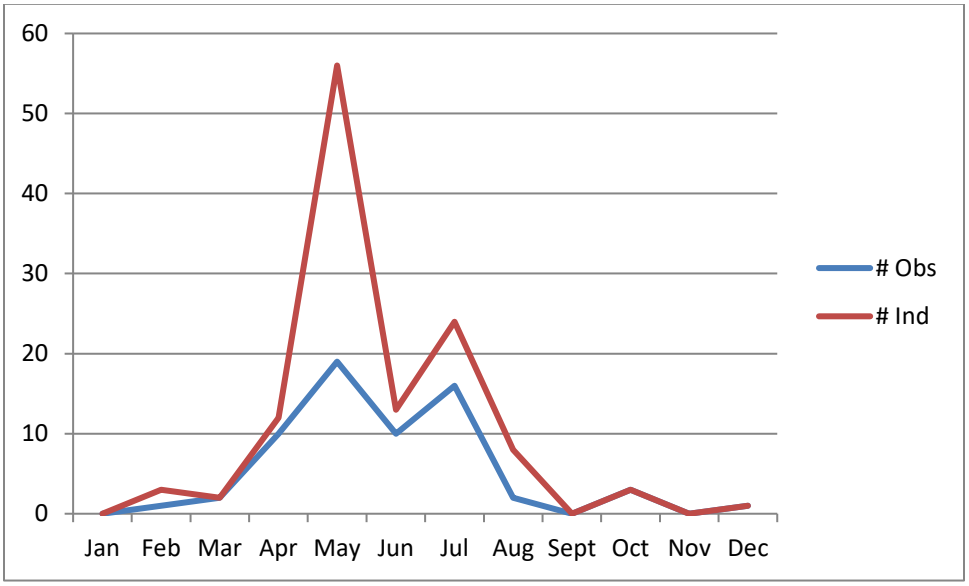


Figure 29. Total number of observations and individual small perching birds for each month during onsite surveys at FDK.

Small perching bird abundance varied on the airfield, with the greatest counts observed near onsite survey point #3 (Figure 30). An elevated count of small perching birds at this location was primarily due to savannah sparrows loafing within the maintained fields. Savannah sparrows will nest and forage for insects within short-maintained grasses. Most savannah sparrows will remain in and near grass cover and not frequent pavement areas.

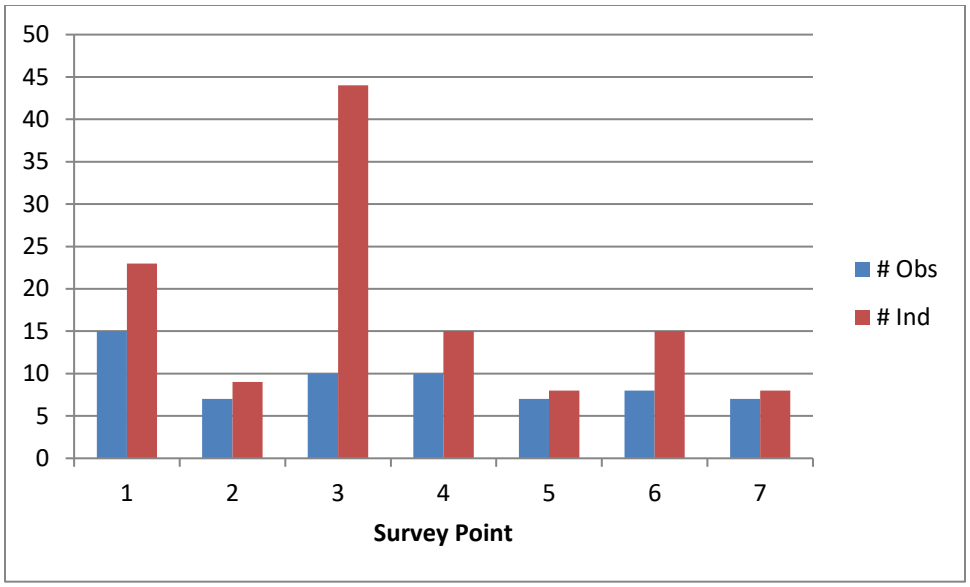


Figure 30. Total number of observations and individual small perching birds near each onsite survey point at FDK.

Small perching birds recorded during onsite surveys were most often observed loafing on the ground (Figure 31). This behavior is common for savannah sparrows, due to their attraction to maintained grass fields and often the absence of perching areas. In addition, other species such as the house sparrow will loaf and forage on pavement areas.

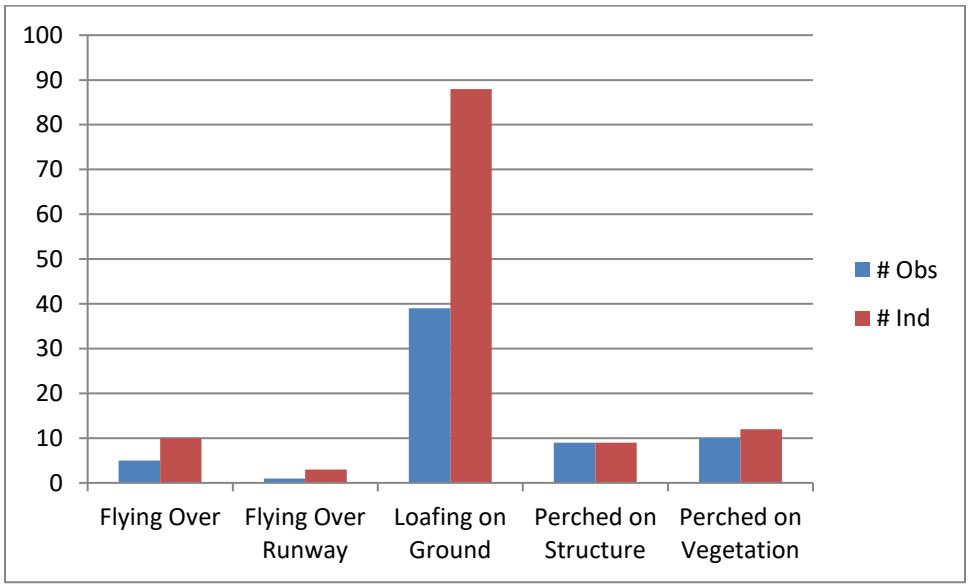


Figure 31. Total number of observations and individual small perching birds for each behavior category during onsite surveys at FDK.

B. Offsite Avian Surveys

Offsite surveys were conducted at four offsite survey points that have potential to attract hazardous wildlife near flight patterns around FDK. Bird abundance and local movements can pose hazards to aircraft and potential increase the number of wildlife making their way onto airport property. A total of 6,499 individual birds of 51 different species of birds were recorded. Similar with onsite surveys, European starlings were the most abundant bird species recorded during offsite surveys (4,309 individuals). Based solely on total individuals, blackbirds (72%), small perching birds (14%) and other flocking birds (5%) were the 1st, 2nd and 3rd most abundant guilds recorded, respectively.

1. Behavior

Birds observed during offsite surveys were recorded in the greatest counts loafing on the ground (Figure 32). Given the high abundance of total individuals and the low overall total observations, birds recorded loafing on the ground were most often observed in moderate to large sized flocks. These behaviors do not pose a hazard to aircraft at offsite locations, due to the birds being at ground level and not within the airspace surrounding the airfield. Movements of birds to and from their loafing locations pose the greatest hazards to aircraft.

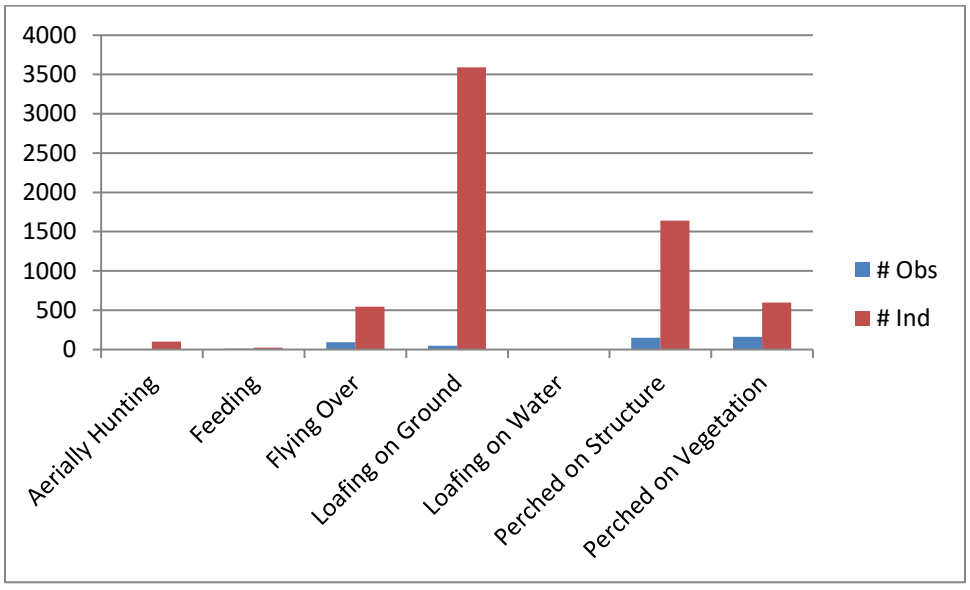


Figure 32. Total number of observations and individual birds for each behavior category during offsite surveys at FDK.

Behaviors exhibited by birds varied throughout the day (Figure 33). The greatest percentage of individual birds was observed loafing on the ground during dawn surveys. Then in mid-morning and afternoon surveys, a greater percentage of birds were recorded perching on structures. These changes in behavior are likely due to birds foraging in the morning and resting in the middle of the day. At dusk, a moderate percentage of birds were perching and loafing on the ground, likely foraging on last time before returning to their roost. FDK staff should be aware that bird

behavior can very throughout the day. At offsite locations, daily movements to and from roosting and feeding locations can increase the potential for flocks of birds to cross flight patterns around the airfield.

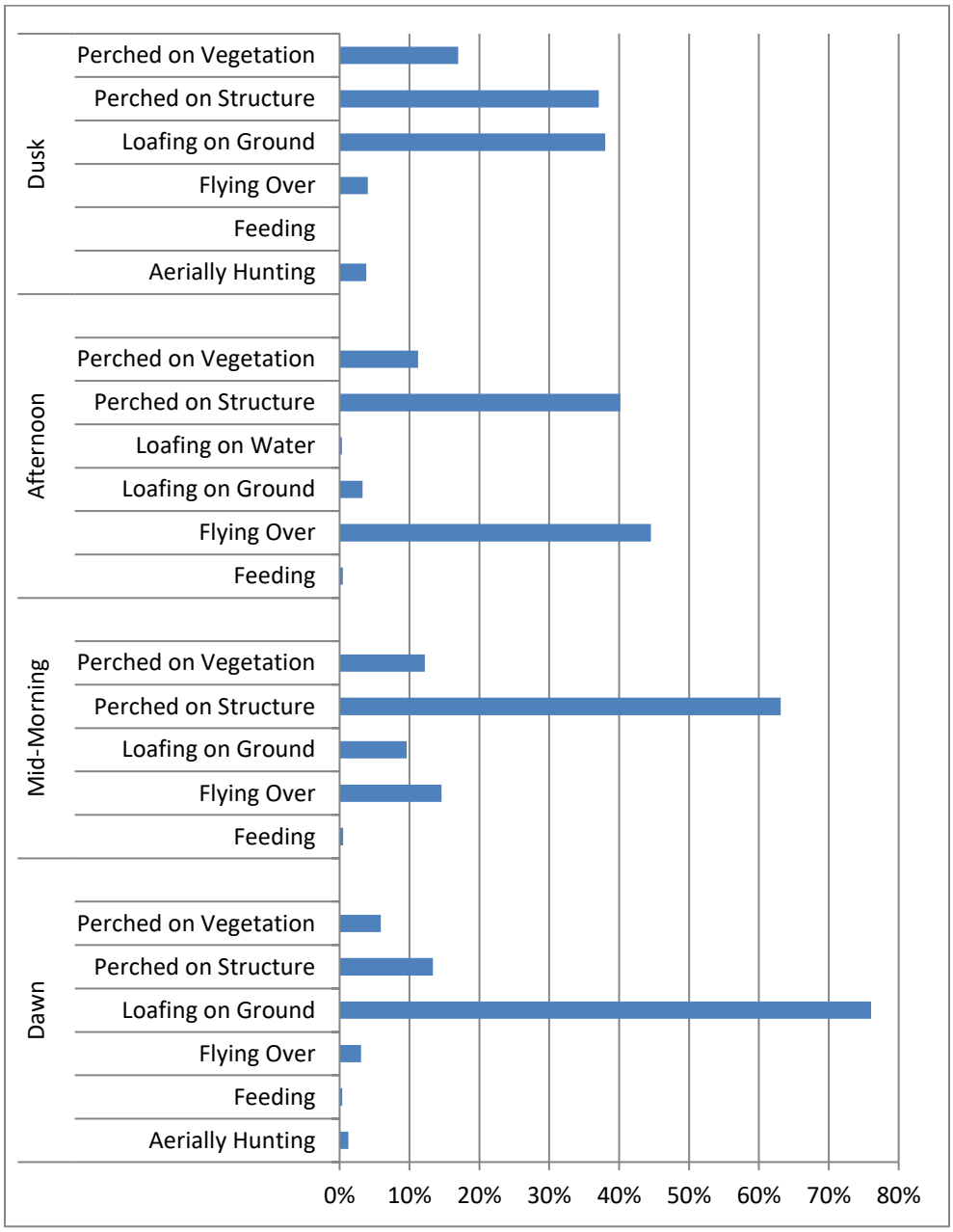


Figure 33. Percentage of individual birds for each behavior category by time of day.

2. Habitat Use

Birds were recorded in the greatest numbers near offsite survey point #10 (Figure 34). This survey pint overlooked the County of Frederick Department of Solid Waste Facility. Solid waste facilities can be highly attractive to hazardous flocks of birds such as vultures, blackbirds and gulls. Although the landfill is located 2.95 miles southeast of the airfield, increased flocks of bird dawn to the location have the potential to make their way to the airfield in search of additional food sources. Overall bird flocks observed at offsite survey point #10 were relatively small, with only one observation of a flock size 3000+ individuals.

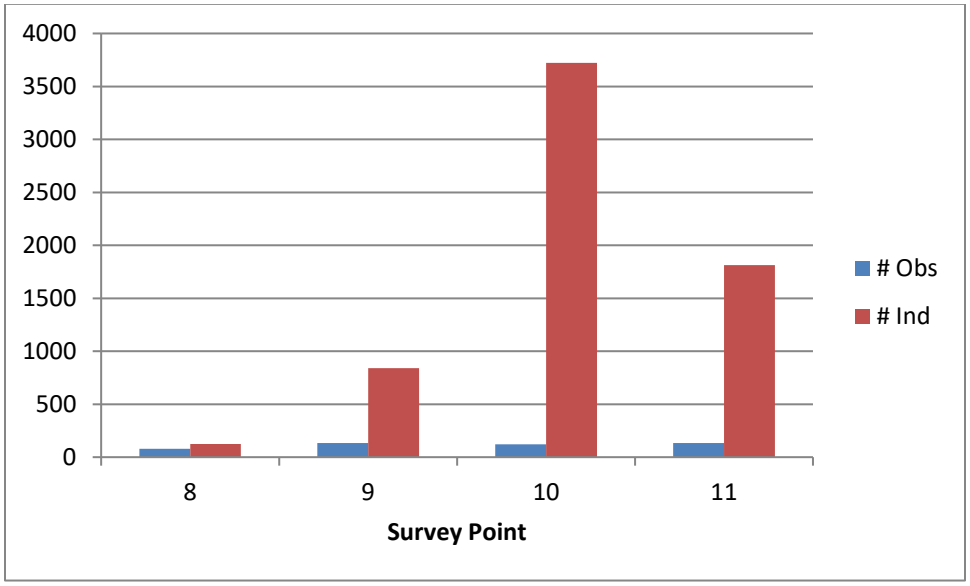


Figure 34. Total number of observations and individual birds at each offsite survey point at FDK.

Of the birds observed during offsite surveys, the greatest numbers were recorded within landfill habitats (Figure 35). High counts of birds were also recorded within agriculture and residential/industrial habitats. Landfills can attract a large variety of bird species due to the potential food sources within the solid wastes. In addition, buildings and stagnant debris piles can provide cover and nesting habitats for species like the European starling. FDK staff should establish communication with the County of Frederick Solid Waste Facility to discuss wildlife hazards around the airfield.

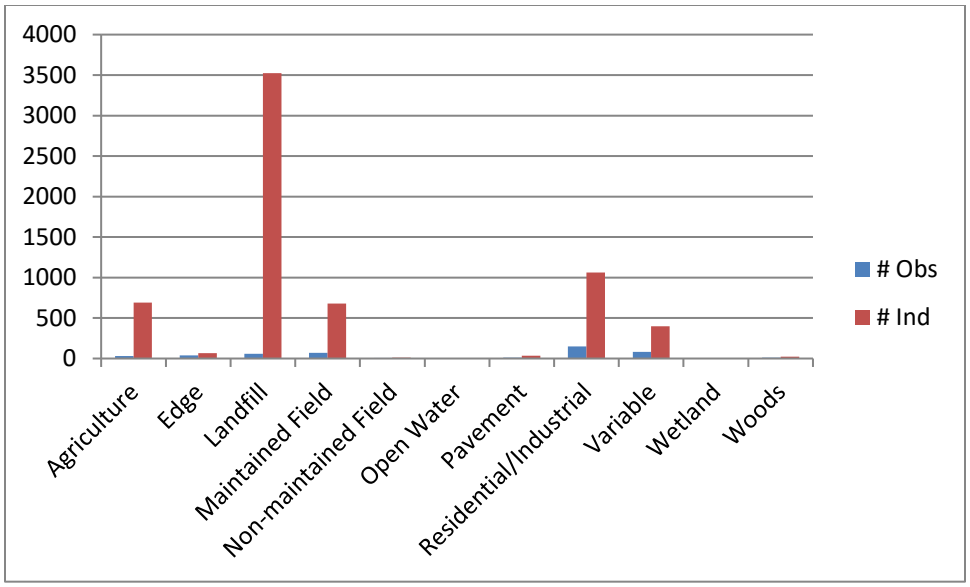


Figure 35. Total number of observations and individual birds recorded within each habitat type during offsite surveys at FDK.

3. Seasonal Activity

Bird abundance during offsite surveys varied by month throughout the assessment, with the large spike recorded in September (Figure 36). A dramatic increase in bird abundance in September was primarily due to a large flock (3000+ individuals) of European starlings at offsite survey point #10. Overall, bird abundance remained relatively low throughout each month, with another small increase observed in July. FDK staff should be aware that seasonal changes can lead to potential increases in bird abundance around the airfield.

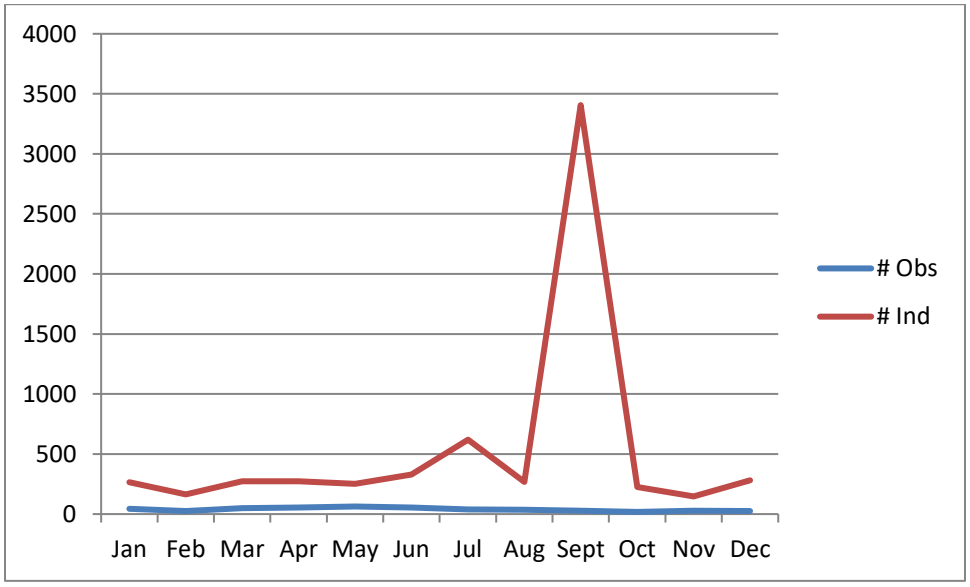


Figure 36. Total number of observations and individual birds for each month during offsite surveys at FDK.

4. Daily Activity

Bird counts were the highest during dawn surveys, then dramatically dropped into the mid-morning and afternoon, and gradually increased by dusk (Figure 37). A peak in bird activity at dawn is likely due to birds leaving their roosting locations and seeking out areas to forage. Areas like the solid waste facility and the farm can provide birds with a variety of food items. Decreases in the middle of the day is likely due to birds seeking out areas to loaf and rest during the heat of the day, before foraging again prior to returning to their roosts. FDK staff should be aware of changes in bird concentrations and activity throughout the day in areas around the airfield.

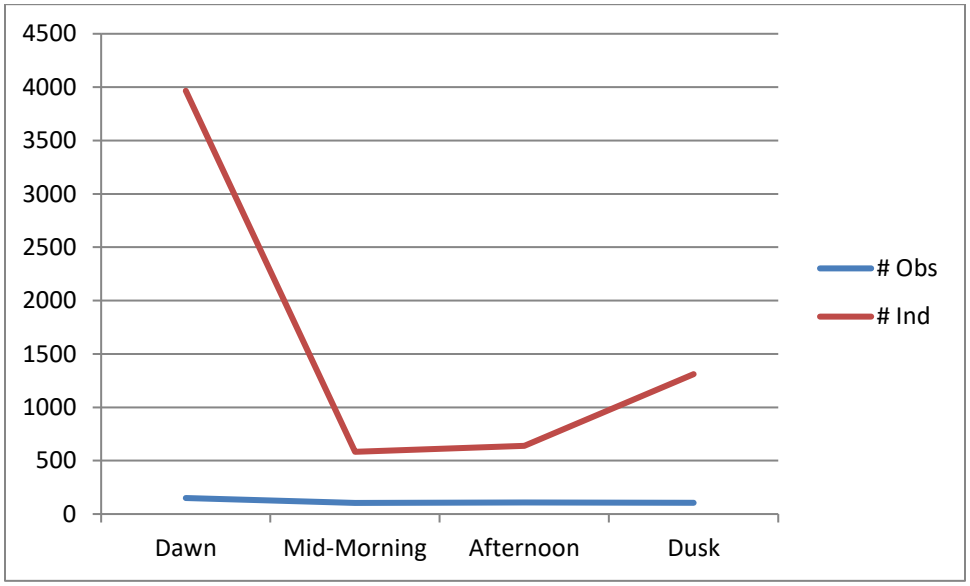


Figure 37. Total number of observations and individual birds for each survey time of day during offsite surveys at FDK.

5. Guild/Species Presence

A total of 6,499 individual birds of 51 different species of birds were recorded during offsite surveys around FDK (Table 6, page 54). Blackbirds where the most abundant guild recorded and the 2nd most commonly observed guild during offsite surveys at FDK (Figures 38 &39). While at offsite locations, hazards posed by blackbirds decreases as the distance away from the airfield increases. Blackbirds pose a significant hazard due to their flocking tendencies; however, at offsite locations these flocks will often stay at relatively low altitudes and do not pose a significant hazard to aircraft. Small perching birds were the most commonly observed and the 2nd most abundant guild recorded. At offsite locations, small perching birds are not considered hazardous to aircraft due to their tendencies to remain near brush/cover and they often do not form flocks.

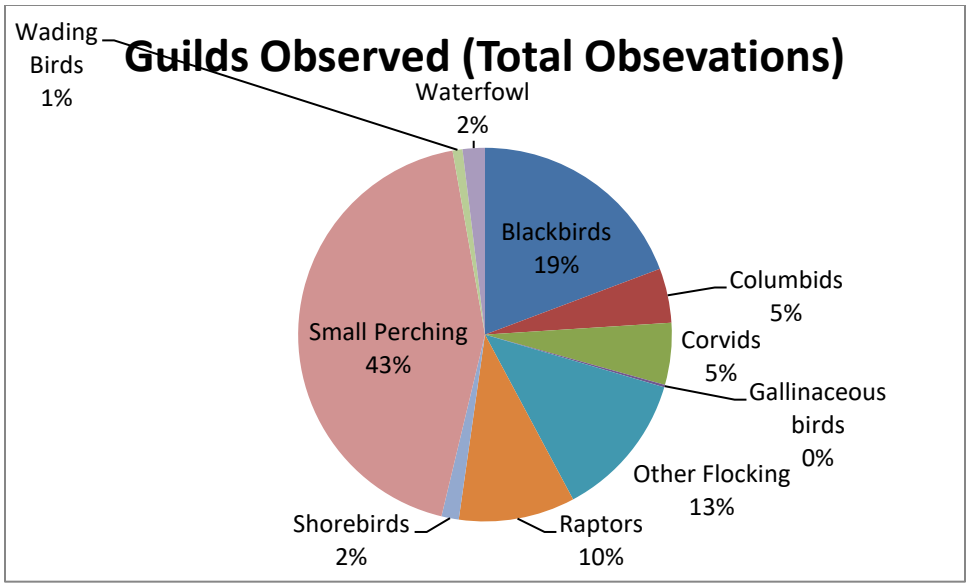


Figure 38. Percentage of guilds observed based on total observations made during offsite surveys at FDK.

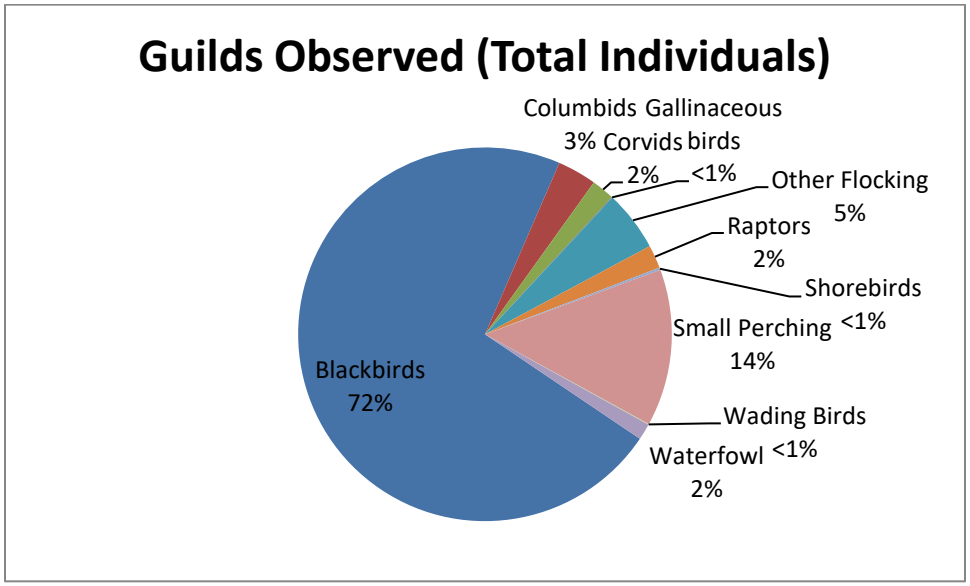


Figure 39. Percentage of guilds observed based on total individuals recorded during offsite surveys at FDK.

Table 6. Guild, species and total number of individual birds recorded during offsite surveys at FDK.

Blackbirds	**4684**
Brown-headed Cowbird	276
Common Grackle	56
European Starling	4309
Red-winged Blackbird	43
Columbids	**220**
Mourning Dove	31
Rock Dove	189
Corvids	**129**
American Crow	123
Blue Jay	5
Fish Crow	1
Gallinaceous birds	**3**
Wild Turkey	3
Other Flocking	**341**
American Robin	90
Bank Swallow	88
Cedar Waxwing	2
Chimney Swift	110
Tree Swallow	51
Raptors	**131**
American Kestrel	6
Black Vulture	33
Red-shouldered Hawk	2
Red-tailed Hawk	1
Turkey Vulture	89
Shorebirds	**13**
Killdeer	13

Small Perching	**883**
American Goldfinch	28
American Tree Sparrow	9
Black-capped Chickadee	33
Belted Kingfisher	4
Blue-grey Gnatcatcher	2
Carolina Wren	3
Common Yellowthroat	1
Dark-eyed Junco	35
Downy Woodpecker	1
Eastern Bluebird	17
Eastern Phoebe	3
House Finch	14
House Sparrow	631
Indigo Bunting	1
Northern Cardinal	32
Northern Flicker	2
Northern Mockingbird	23
Red-bellied Woodpecker	2
Savannah Sparrow	4
Song Sparrow	21
Tufted Titmouse	7
White-breasted Nuthatch	2
Wood Thrush	1
White-throated Sparrow	4
Yellow Warbler	3
Wading Birds	**4**
Great Blue Heron	4
Waterfowl	**91**
Canada Goose	86
Common Merganser	1
Mallard	2
Pied-billed Grebe	2

a. Waterfowl

Common Merganser

Waterfowl is the most hazardous bird guild at offsite locations because of the numbers, large body size and tendency to move in flocks. Waterfowl at offsite locations have the potential to cause collisions with aircraft when sharing airspace in the vicinity of the airport. Local movements of waterfowl from one location to another can bring birds over the airport and/or into the flight paths of aircraft. Waterfowl accounted for 2% of the total observations and 2% of the total individual birds recorded during offsite surveys. A total of 91 individuals of four different species were recorded (Table 6). The most commonly observed waterfowl species during offsite surveys was Canada geese, with 86 individuals recorded.

As previously mentioned, Canada geese pose a significant hazard to aircraft due to their large body size and flocking tendencies. Local populations of Canada geese around Frederick, MD, can pose a hazard to aircraft throughout the year. Local populations will seek nesting locations on open water sources and the Monocacy River near the airfield. Overall, Canada geese numbers were relatively low at offsite survey points; however, several flocks of geese were recorded in incidental observations around small ponds and on the Monocacy River. To reduce local populations of Canada geese, FDK staff should investigate the creation of a Canada goose population program. The program should seek out properties where Canada geese are nesting to addle or oil the eggs. This management technique can reduce the local population by preventing the hatching of new birds in the area. FDK staff could conduct this program internally if airport personnel are available, or contract a wildlife management company to conduct the work. Prior to treatment of any Canada goose nests, proper permitting is required by the USFWS and landowner permission must be obtained.

Waterfowl were most abundant during the month of June (Figure 40). The large increase in waterfowl recorded in June was due to a large flock of resident Canada geese. During June, adult Canada geese will undergo a complete molt of their flight feathers. During the molting period, all flight feathers are shed and they begin growing new ones; at this time the birds are rendered flightless. Canada geese will seek out large open water sources for protection of predators during these periods of molt. While their hazards to aircraft greatly decrease when the birds are flightless, management techniques such as round-ups become easier to collect and remove large numbers of geese.

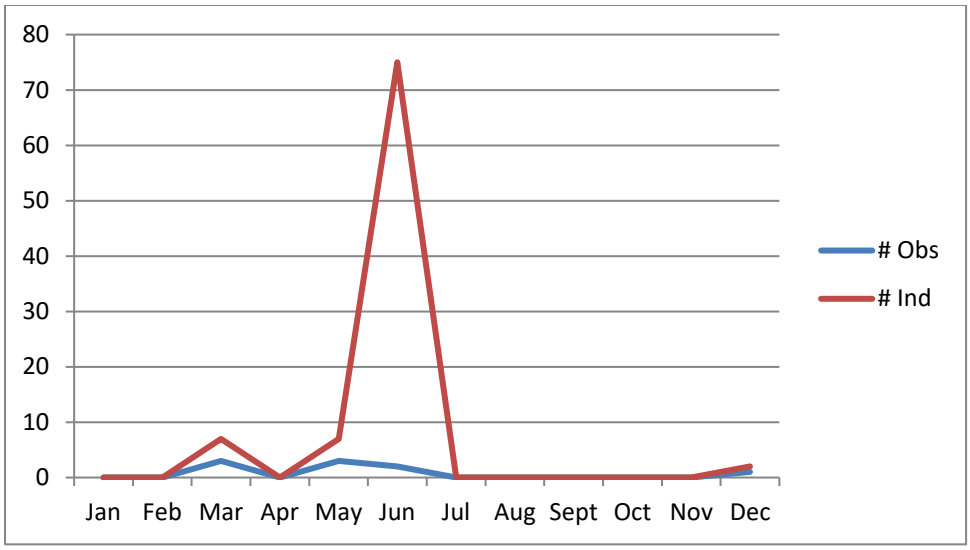


Figure 40. Total number of observations and individual waterfowl for each month during offsite surveys around FDK.

Waterfowl counts were the greatest at offsite survey point #9, Clustered Spires Golf Course (Figure 41). The large numbers of waterfowl recorded at the course were predominantly Canada geese. Geese will frequent golf courses due to the abundance of water features and short-maintained grasses. Geese can also be a nuisance of golf course owners due to the damages they cause to turf from foraging and the accumulation of fecal matter. FDK staff should open a line of communication with the golf course owners and discuss the hazards the geese can pose to aircraft. The airport should encourage the owners of the golf course to manage the property for Canada geese. Given the close proximity of the golf course to the airfield, a line of communication should be established with the ATCT prior to any dispersal as to prevent possible strikes from occurring during dispersal.

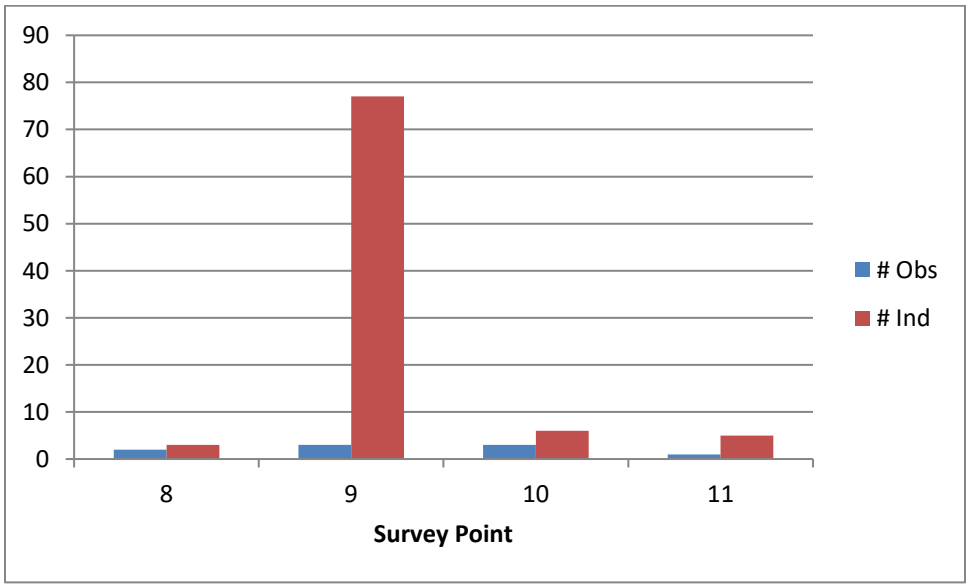


Figure 41. Total number of observations and individual waterfowl near each offsite survey point around FDK.

Waterfowl recorded during offsite surveys were most often observed loafing on the ground (Figure 42). Given the high total number of individuals loafing on the ground compared to the low number of total observations, most observations made were of large flock sizes. Increased numbers of birds loafing is an indication of an attracting habitat that provides food sources with little to no predators. At offsite locations, loafing behaviors are not inherently hazardous to aircraft; however, the movement of birds to and from loafing locations can bring flocks of birds across flight patterns around FDK. Establishing management practices at offsite locations can dissuade birds from moving to and from properties around the airport.

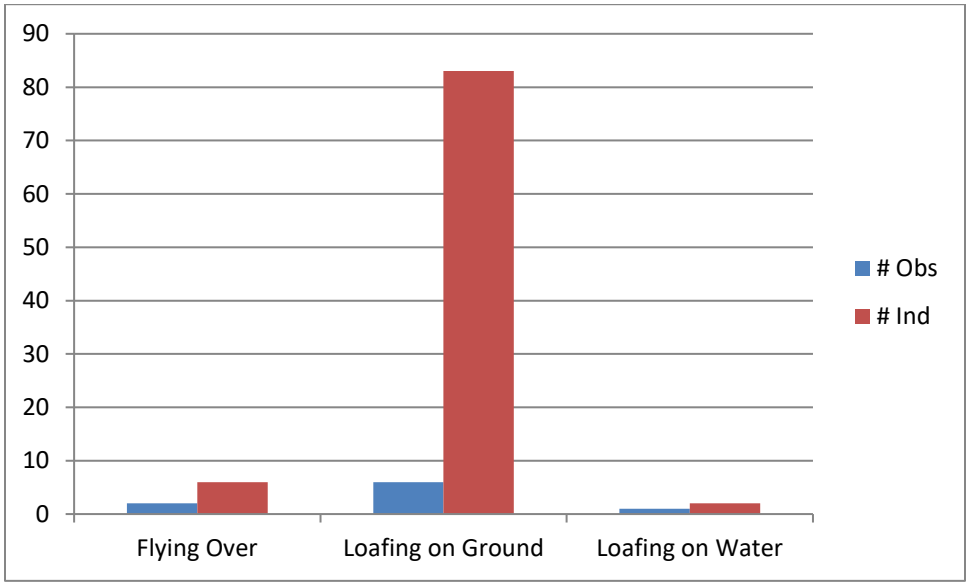


Figure 42. Total number of observations and individual waterfowl for each behavior category during offsite surveys at FDK

b. Gulls

Herring Gull

Gulls are the second only to waterfowl as the most hazardous species to. They pose a similar threat because of their large body size and tendency to form large flocks during their migration. Like waterfowl, gulls are also typically associated with aquatic habitat. No gulls were recorded during offsite surveys around FDK. Although there was a lack of gull observations during the WHA, FDK staff should still be aware of the potential for gulls to occur on or around the airfield. Gulls populations have the potential to be pushed into the area due to weather events or migrations.FDK staff should support a zero-tolerance policy for gulls on the airfield.

c. Blackbirds

Blackbirds are a potential hazard to aviation because of their tendency to form and migrate in large flocks. These flocks increase the potential for multiple strikes in a collision, and have the potential to do serious damage to aircraft. European starlings, a blackbird species, are responsible for the most wildlife-strike-related fatalities in history (Cleary and Dolbeer 2005). Blackbirds accounted for 19% of the total observations and 72% of the total individual birds recorded during onsite surveys. A total of 4,684 individual birds of four different species were recorded (Table 6). Similar with onsite surveys, European starlings were the most abundant species of blackbird recorded (4,309 individuals). Overall, the average flock size of European starlings observed was less than 100 individuals. Most of the starlings recorded were documented in a single event, with a 3000+ sized flock documented during September surveys (Figure 43). Blackbirds will often form migratory flocks when performing migration events. These flocks will seek out attractive habitats to refuel to continue their journey. FDK staff should be aware that high concentrations of blackbirds have the potential to make their way to the airfield. Should a large flock of blackbirds make their way to the airfield, FDK staff should take immediate action to haze them from the airfield. If necessary, they should be removed lethally to reinforce non-lethal harassments.

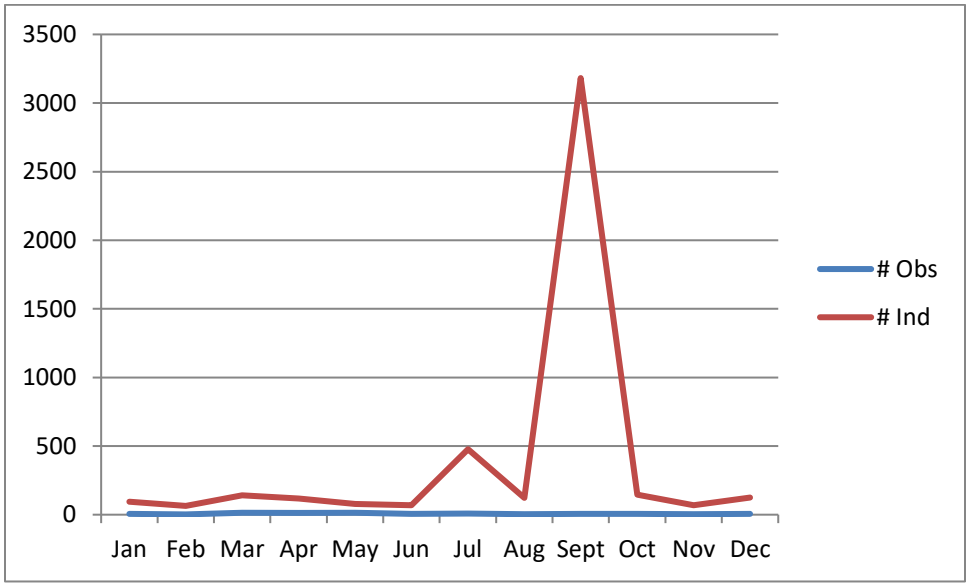


Figure 43. Total number of observations and individual blackbirds for each month during offsite surveys at FDK.

Blackbirds were most abundant at offsite survey point #10, County of Frederick Solid Waste Facility (Figure 44). Blackbirds will often be attracted to solid waste facilities due to the food items in the waste and the potential nesting sites around the facility. The survey point did not overlook the active face of the facility. Flock in size and magnitude could be more frequent around the facility then what was recorded during the WHA.

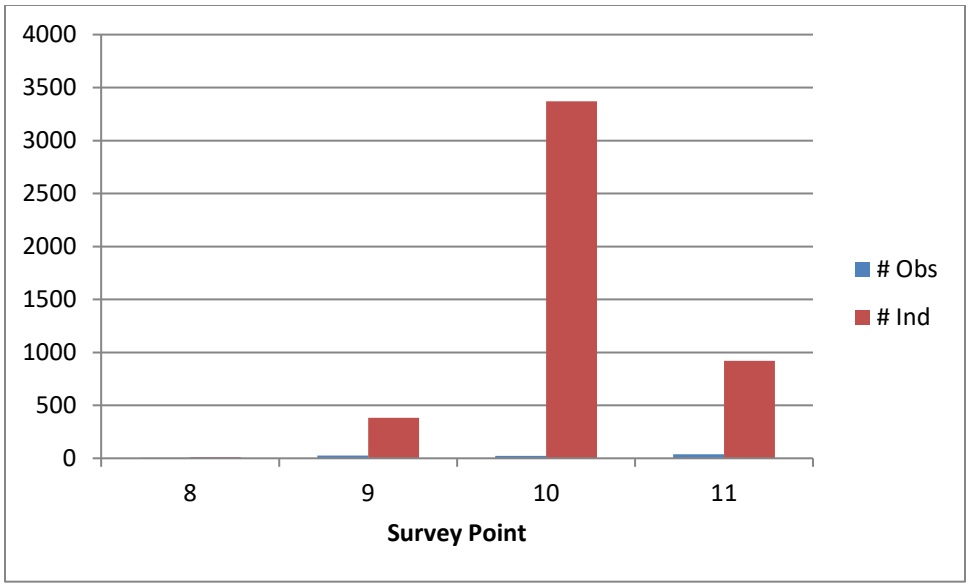


Figure 44. Total number of observations and individual blackbirds at each offsite survey point around FDK.

Blackbirds were recorded in the greatest numbers loafing on the ground (Figure 45). These behaviors are often exhibited when searching for food items. At offsite locations, these behaviors do not pose a direct hazard to aircraft; however, increased concentrations of blackbirds around a prevalent food source can increase the potential for flocks to make their way to the airfield. In addition, flocks of blackbirds traveling from roosting locations to foraging habitats could potentially cross fight paths in/out of the airfield.

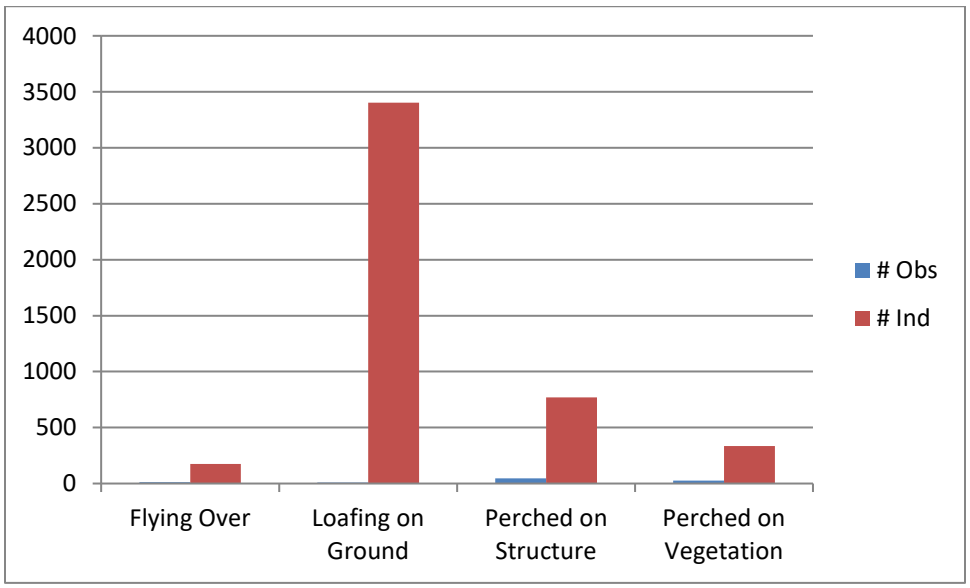


Figure 45. Total number of observations and individual blackbirds for each behavior category during offsite surveys.

d. Raptors

Black Vulture

Raptors have the potential to be a significant threat to aviation at offsite locations. They have large bodies that can create severe damage during a strike. Raptors also frequently soar at high altitudes for extended periods of time to search for food, which increases the chances of colliding with aircraft. However, raptors are more often found individually and generally do not form large flocks as often as other guilds. Turkey vultures and black vultures are raptor species that will commonly group together and circle over an animal carcass or other food source. They will also fly into favorable wind conditions that allow them to maintain soaring without exerting themselves, such as updrafts from hills or warm air columns. Raptors accounted for 10% of the total observations and 2% of the total individual birds recorded during offsite surveys. A total of 131 individual birds of five different species were recorded (Table 6). Turkey vultures (89 individuals) and black vultures (33 individuals) were the two most abundant species observed during offsite surveys. As mentioned with onsite survey results, vultures are large bodied birds that are capable of causing significant damages if struck. Even at off the airfield, the soaring flight characteristics can pose to aircrafts due to the birds being able to sustain flight at high altitudes.

Overall, raptors were most abundant during the months of August and September (Figure 46). A large increase in raptors during late summer and fall could be migratory flocks beginning to concentrate in numbers on their way south towards warmer climates. Variations in food availability can also influence the concentrations of raptors around offsite properties. Vultures will often concentrate in numbers around carrion. Wildlife struck by vehicles can become a significant food attractant, causing an increase in vultures. FDK staff should communicate with the county DOT to insure that any wildlife struck on the road within 20,000 feet of the airfield are quickly collected and disposed of prior to becoming an attractant.

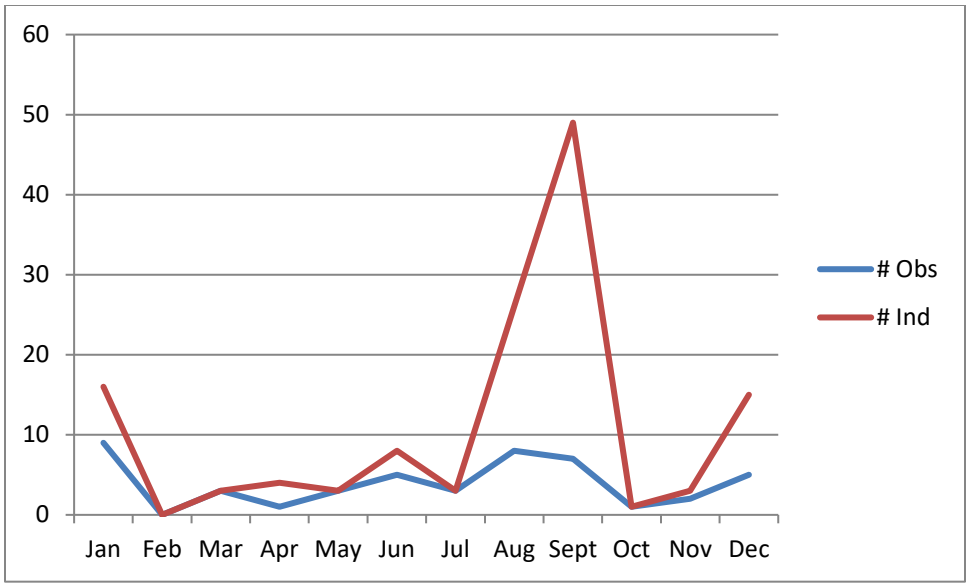


Figure 46. Total number of observations and individual raptors for each month during offsite surveys at FDK.

Raptors were recorded in the greatest counts at offsite survey point #10 (Figure 47). The solid waste facility can be a significant attractant to a variety of raptor species. Vultures are often attracted to food items that are mixed within the waste streams. American kestrels (*Falco sparverius*) and red-tailed hawks (*Buteo jamaciensis*) are also attracted to landfills due to presence of small mammals within the grass fields and around the waste stream. Any influx in raptors to the solid waste facility can increase hazards to aircraft using FDK not only at the facility, but due to their flight paths to and from the facility from roosting sites.

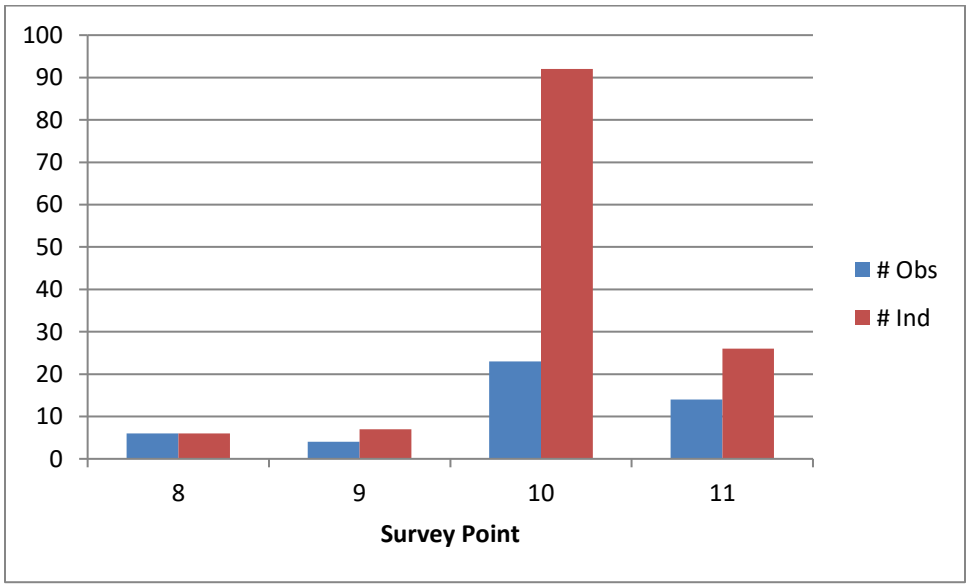


Figure 47. Total number of observations and individual raptors at each offsite survey point around FDK.

Raptors were most often observed perching on structures and flying over the survey point during offsite surveys (Figure 48). Raptors will often spend extended periods of time perching on tall structures overlooking open fields in search of food sources. These behaviors are not inherently hazardous at offsite locations due to the birds being at low altitudes. However, raptors in flight can pose a more significant hazard to aircraft. Raptors recorded in flight were at an estimated average of 185 feet AGL, with observations of raptors up to 500 feet AGL. At these elevations, hazards posed to aircraft greatly decrease the further the birds are from the airfield.

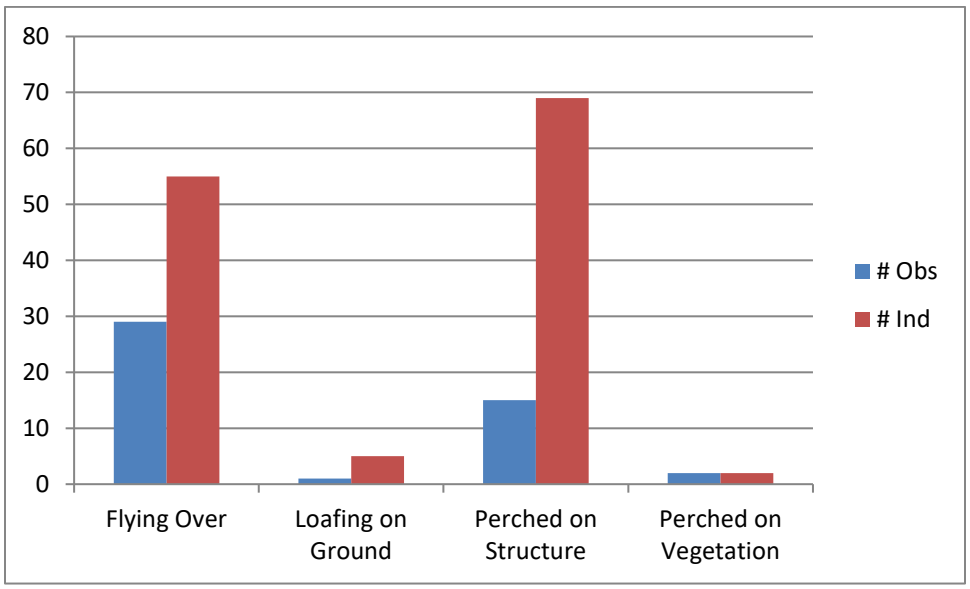


Figure 48. Total number of observations and individual raptors for each behavior category during offsite surveys at FDK.

e. Columbids

Columbids present a similar hazard as blackbirds because they often form large flocks to migrate, which increases the potential for multiple strikes in a single collision. Mourning doves are a member of this guild and are considered to be the most abundant game bird in North America (Robbins et al 2001). Columbids accounted for 5% of the total observations and 3% of the total individuals recorded during offsite surveys. A total of two species of columbids were recorded: mourning dove (31 individuals) and rock doves (189 individuals). Rock doves are an exotic species introduced to North America. Since their introduction, they heave readily adapted to surviving with and around human developments, taking advantage of abundant food sources around agricultural facilities and nesting areas within urban and suburban habitats. Rock doves are a medium sized bird, weighing around 9 ounces and have a wing-span up to 28 inches. The FAA ranks rock doves as the 17th most hazardous species to aviation (FAA AC 150/5200 32B).

Columbids were most abundant during January and December surveys (Figure 49). Dramatic increases in columbids during these months was primiarily due to moderate sized flocks concentrating around abundant food sources. Columbids will forage on large grass seeds and

waste agricultural grains. During the winter, these food sources can be come scarce, which can increase flock concentrations around persisting food reserves.

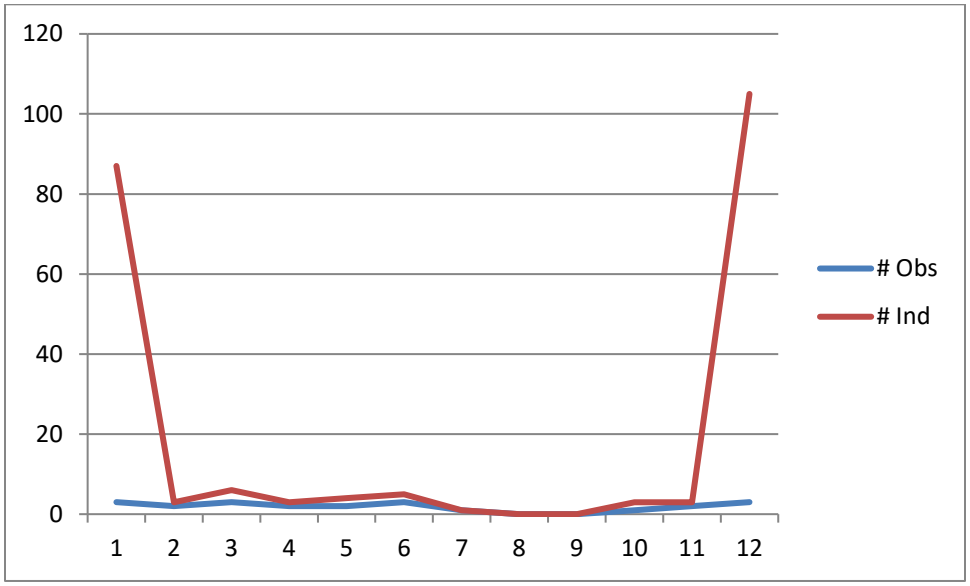


Figure 49. Total number of observations and individual columbids for each month during offsite surveys at FDK.

Columbid counts were the greatest at offsite survey point #11, a farm and grain storage property northeast of the airfield (Figure 50). The dramatic increase in columbids at this property was due to the concentration of food items. In addition, farm properties often have outbuildings that can provide roosting and nesting habitats for columbids. FDK staff should open lines of communication with surrounding farms to discuss the hazards columbids can pose to aircraft. FDK staff should urge property owners to manage rock dove populations to reduce the potential of flocks making their way to the airfield. Being an invasive species, rock doves can be managed without a permit any time of the year. With populations left unmanaged, rock dove populations can double within a year; due to their ability to produce multiple broods throughout the year.

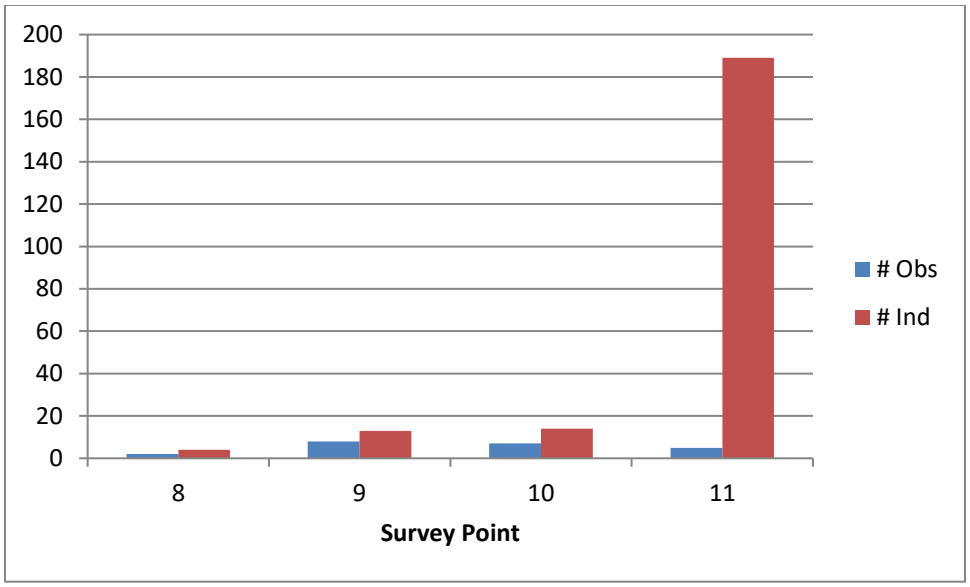


Figure 50. Total number of observations and individual columbids at each offsite survey point at FDK.

Columbids recorded during offsite surveys were observed in the greatest numbers flying over the survey point (Figure 51). Columbids will often fly in small to moderate sized flocks, which can increase the potential for multiple wildlife strikes to occur with an aircraft. However, columbids in flight are often at lower altitudes, and their hazards to aircraft greatly decrease the further away from the airfield the flocks are flying.

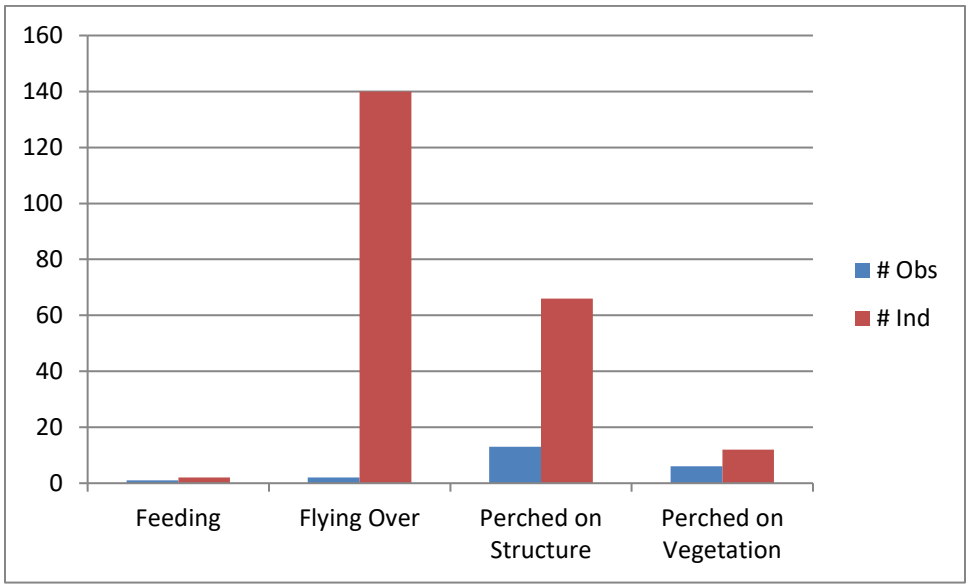


Figure 51. Total number of observations and individual columbids for each behavior category during offsite surveys at FDK.

f. Wading Birds

Great Blue Heron

Wading birds are large-bodied birds that have long, slender legs and necks. This guild of birds can be attracted to any open water source on an airport where they can feed. Many species of wading birds will also feed on insects, amphibians, retiles and small mammals in vegetated areas of the airport. Wading birds accounted for 1% of the total observations and <1% of the total individual birds recorded during offsite surveys. Overall a total of four great blue herons were recorded (Table 6). Due to their large body size, great blue herons can pose a significant hazard to aircraft; however at offsite locations, they often remain on the ground or fly at low altitudes. The four herons recorded were documented during February (1 individual), June (2 individuals), and August (1 individual). A total of 2 individuals were recorded at both offsite survey points #8 and #10. FDK staff should be vigilant to haze herons anytime they are observed flying over the field.

g. Shorebirds

Shorebirds have a very similar biology to wading birds. These birds range greatly in size and can be very large birds with the potential to cause severe damage in the event of a collision. Shorebirds are frequently attracted to aquatic habitats; however, several species will frequent open grassland habitats. Shorebirds accounted for 2% of the total observations and <1% of the total individuals recorded during offsite surveys at FDK. A total of 13 killdeer were documented at offsite survey points throughout the WHA. Overall shorebird abundance was relatively low throughout the WHA, with the highest counts of four individuals recorded during April surveys (Figure 52). Although shorebird counts were low during the WHA, FDK staff should be aware of the potential for migratory flocks of shorebirds to migrate through the area. Shorebirds can form moderate sized flocks during migration, which can increase hazards posed to aircraft.

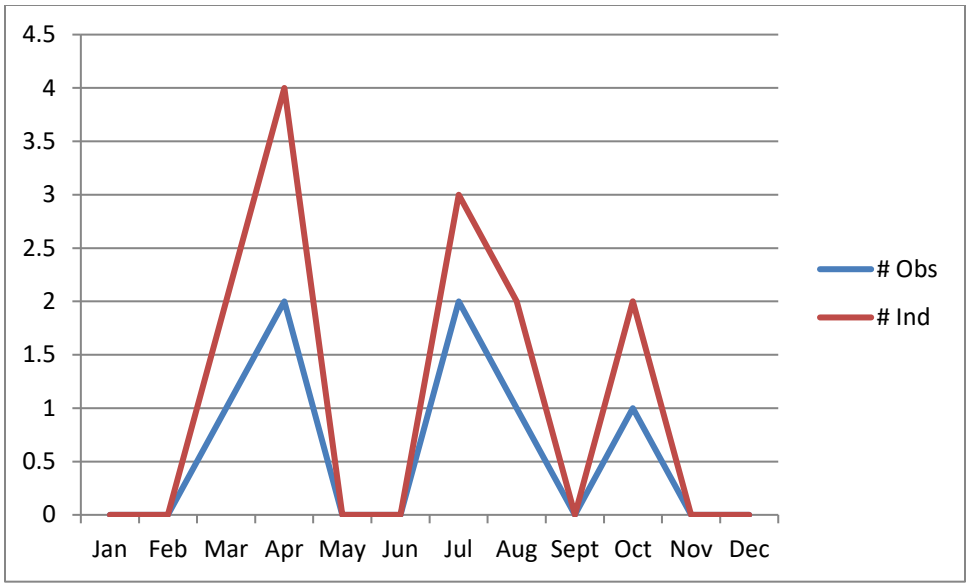


Figure 52. Total number of observations and individual shorebirds for each month during offsite surveys at FDK.

All shorebird observations made during offsite surveys were documented at offsite survey point #10. Killdeer were specifically attracted to the solid waste facility due to the large expanse of maintained grass fields. These areas can provide cover and food sources that are often sought by killdeer. In addition, all observations of killdeer were of individuals loafing on the ground. Killdeer spend the majority of their time on the ground and do not readily perch on vegetation or structures. At offsite locations, these behaviors are not inherently hazardous to aircraft. When abundant cover and food sources are present, local populations of killdeer will often stay near their established territories, and not make any long commutes to food sources.

h. Corvids

Corvids have the potential to be a threat at offsite locations because of their medium body size that can cause damage in a collision. However, as their distance from the airport increases, this danger is reduced. They typically have low flight altitudes and are a minimal hazard to aircraft at offsite survey points. Corvids accounted for 5% of the total observations and 2% of the total individuals recorded during offsite surveys at FDK. A total of three species of corivds were documented during offsite surveys, with American crows being the most commonly observed species (123 individuals, Table 6). Corvid abundance was the greatest during August and September surveys (Figure 53). The dramatic increase in corvid abundance during these months was likely due to local flocks concentrating around an abundant food source.

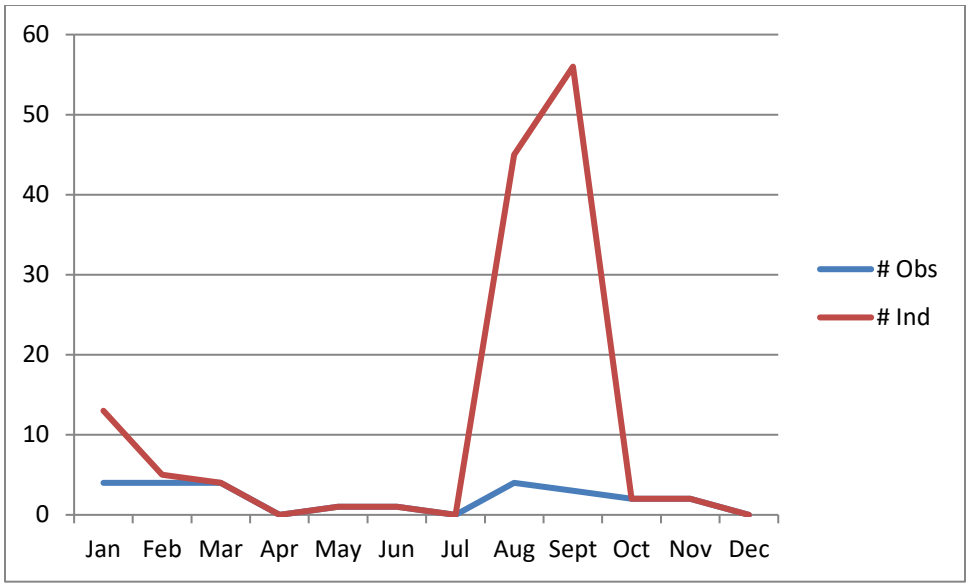


Figure 53. Total number of observations and individual corvids for each month during offsite surveys at FDK.

Corvid counts were the greatest at offsite survey point #10 (Figure 54). Corvids will often seek out easily obtained food sources, such as food wastes in the waste stream at the solid waste facility. Due to the abundance of corvids around the solid waste facility, FDK staff should communicate with the property owners and encourage them to conduct wildlife management on the property. Increased harassments on the solid waste facility property can discourage corvids from flocking on the sites, and encourage them to seek food sources elsewhere.

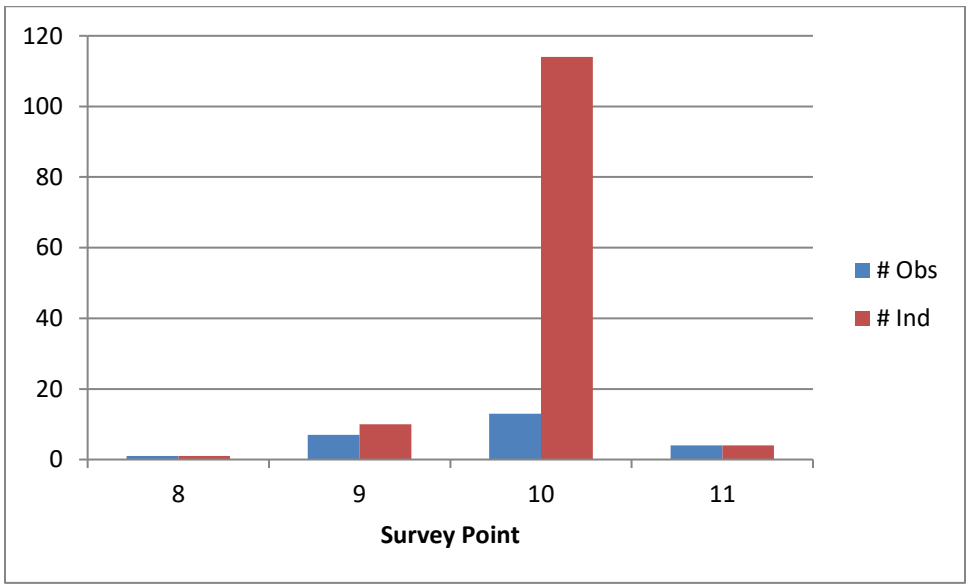


Figure 54. Total number of observations and individual corvids at each offsite survey point at FDK.

Corvids recorded during offsite surveys were most often observed perching on structures and loafing on the ground (Figures 55). These behaviors are commonly exhibited by corvids. Loafing and perching behaviors are not inherently hazardous to aircraft at offsite locations due to the

birds being at a low elevation. Increased hazards to aircraft occur when flocks are in flight; however, FDK staff should be aware of increased concentrations of corvids at offsite properties have the potential to make their way to the airfield in search of food.

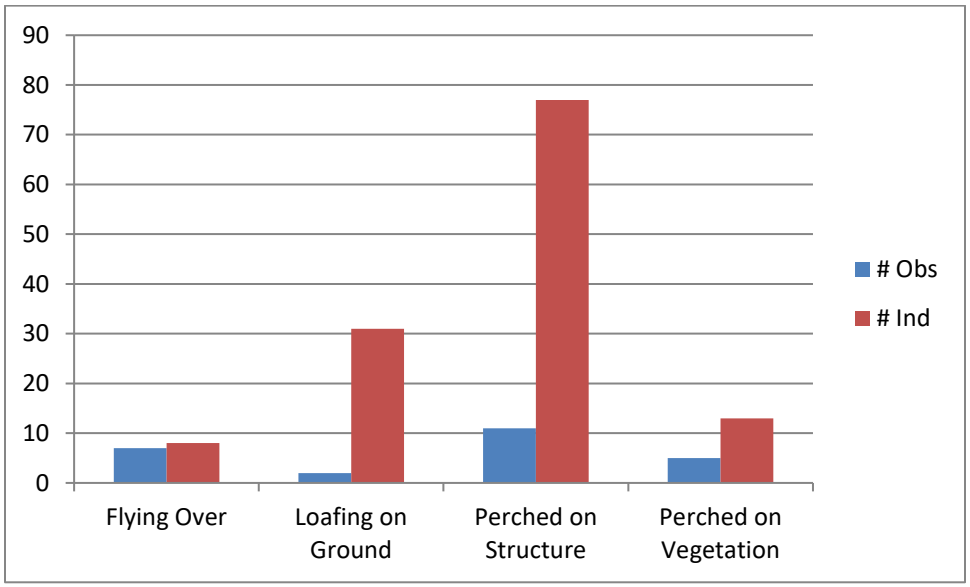


Figure 55. Total number of observations and individual corivds for each behavior category during offsite surveys.

i. Gallinaceous Birds

Wild Turkey

Gallinaceous birds are heavy bodied birds that spend a large portion of their time on the ground. They are typically not strong fliers. The danger posed by these birds is greatly reduced with increased distance from the airport. They do not fly at high altitudes so there is a low probability that they will collide with aircraft. However, close to the airport, collisions with these species can be extremely dangerous because of their large bodies. A total of 3 wild turkey were recorded during offsite surveys, accounting for <1% of the total observations and individual birds recorded (Table 6). Wild turkeys are large bodied birds, weighing around 16 pounds and have a wingspan up to 64 inches. Due to their large body size, they have the potential to cause significant damage to aircraft if struck. However, hazards posed to aircraft at offsite locations is greatly reduced due to the birds typically not flying at high altitudes and taking flight for only short durations. The three turkeys recorded during offsite surveys were documented at offsite survey point #11 in February.

j. Other Flocking

Other flocking birds pose a hazard at offsite locations because of their tendency to form large flocks. Hazards posed by even large flocks of these birds decreases as the distance from the

airport increases. Other flocking birds accounted for 13% of the total observations and 5% of the total individual birds recorded during offsite surveys. A total of five species of other flocking birds were documented, with chimney swift (*Chaetura pelagica*) being the most abundant (110 individuals, Table 6). Chimney swifts are small bodied bird, weighing less than 1.0 ounces and have a wingspan up to14 inches. They are an insectivore species, feeding on insects while in flight. They will often nest in colonies in man-made chimneys, and typically forage within flocks. Chimney swifts are ranked the 34th most hazardous species to aviation.

Other flocking birds recorded during offsite surveys where most abundant during May and September (Figure 56). Increases in other flocking birds around FDK can be influenced by several factors including weather, seasonal changes and food abundance. Food sources for other flocking birds can vary by the species; some birds such as swallows and swifts actively forage on insects while in flight, while other species such as American robins (*Turdus migratorius*) will feed on a variety of invertebrates and berries. Species within this guild will perform extensive seasonal migrations during the fall, winter and spring.

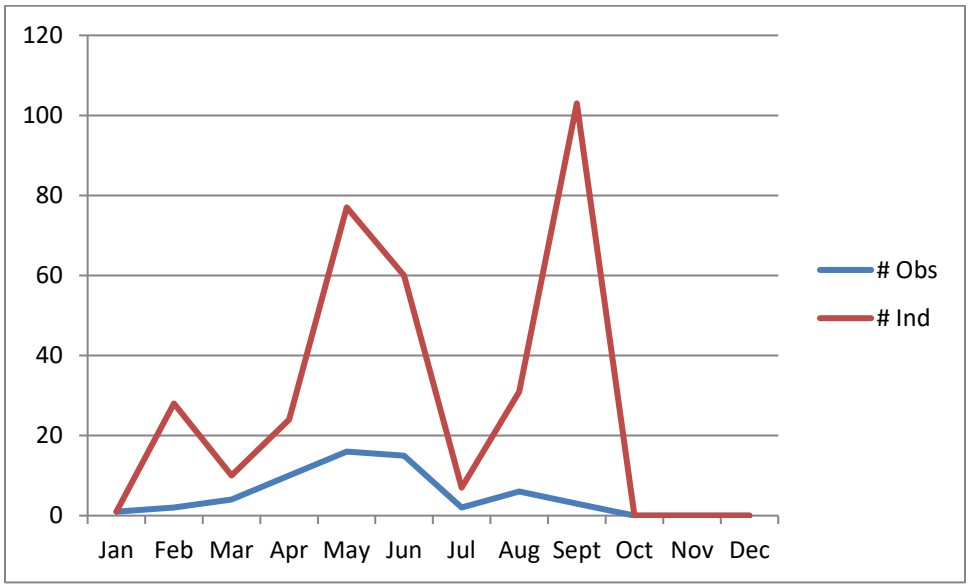


Figure 56. Total number of observations and individual other flocking birds for each month during offsite surveys at FDK

Other flocking birds were recorded in the greatest numbers at offsite survey points #9 and #11 (Figure 57). These locations likely attracted other flocking birds due to the combination of maintained grass fields and edge habitats. In addition, the small pond and Monocacy River can host a variety of insects that in turn attract the aerial insectivores.

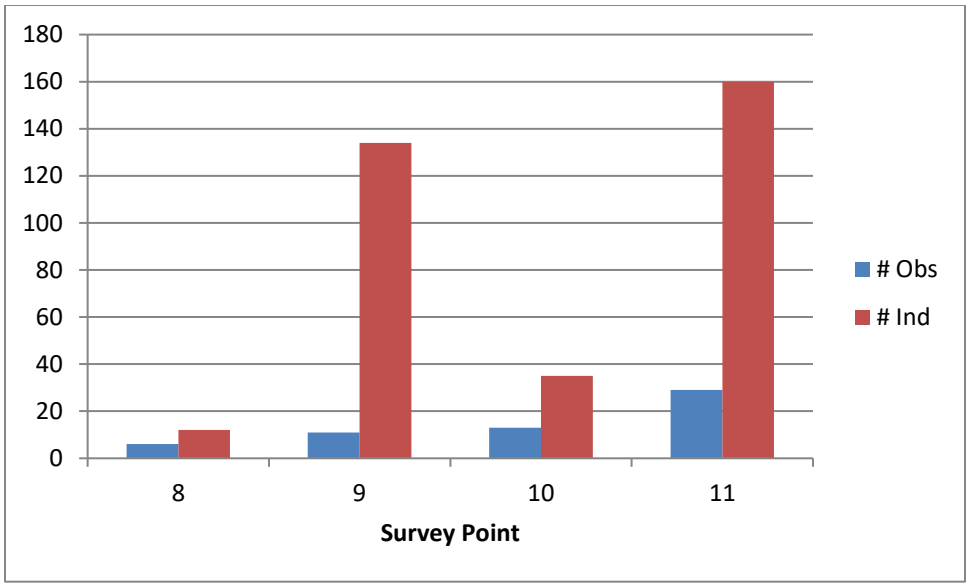


Figure 57. Total number of observations and individual other flocking birds at each offsite survey point at FDK.

Other flocking birds recorded during offsite surveys were observed exhibiting a variety of behaviors, with increased counts aerially hunting and flying over the survey point (Figure 58). High numbers of total individuals, with low numbers of total observations indicates that birds were within moderate sized flocks for both these behaviors. Average flocks ranged around 50 individuals. Both of these behaviors can pose hazards to aircraft at offsite survey points; however, flocks recorded did not exceed an estimated 100 feet AGL. FDK staff should be aware of increased concentrations of other flocking birds around the airfield. Insect populations on the airfield can greatly affect the chances of flocks seeking out the airfield to forage. FDK staff should be vigilant to haze any flocks that are observed on the airfield.

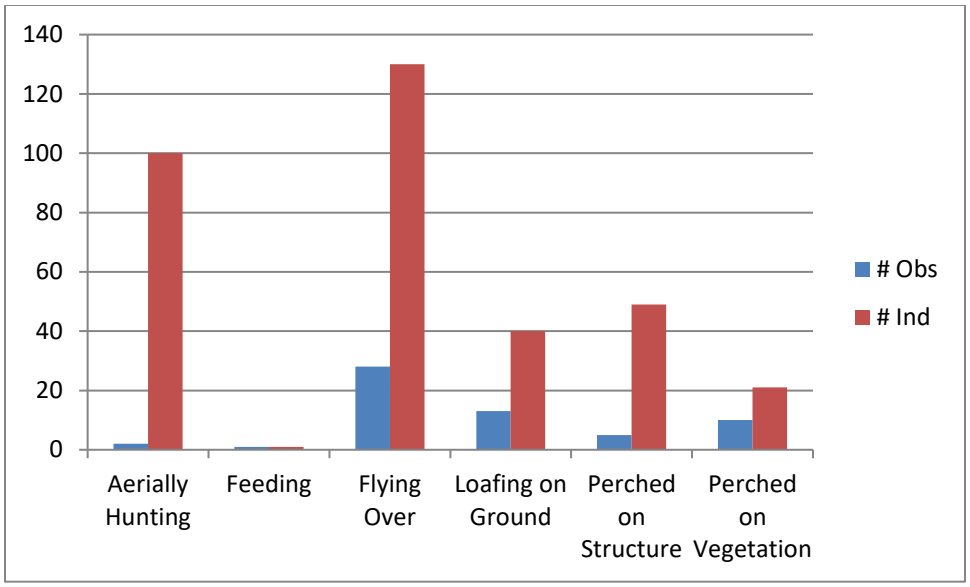


Figure 58. Total number of observations and individual other flocking birds for each behavior category during offsite surveys at FDK.

C. Mammal Surveys

1. Large Mammals

Large mammal surveys were conducted two times per month. Spotlights were used to document the abundance and distribution of mammals on the airfield. Surveys were conducted during the night, as the biologist drove on all pavement areas within the perimeter fence. A total of 175 individual mammals of three distinct species were recorded (Table 7, below). White-tailed deer were the most commonly observed species during spotlight surveys at FDK. A total of 147 white-tailed deer were documented on the property. It is important to note, that it is likely that many individuals were re-counted during separate surveys. Herd sizes documented during spotlight surveys varied between 2-20 individuals in a single sighting. Deer are considered the most hazardous species to aviation (FAA AC 150/5200 32B). Deer can range from 85-250 pounds, and are highly unpredictable when frightened. FDK staff should support a zero tolerance policy for white-tailed deer on airport property. The absence of a perimeter fence at FDK allows white-tailed deer free access to property and onto movement areas. Several times during onsite bird surveys, a small herd of deer were noted crossing runways, or running alongside the runway. Airport staff utilizes city employees to remove deer under permit to reduce numbers. FDK Staff should investigate the installation of complete perimeter fence around the AOA to exclude white-tailed deer and other mammal species. Until the perimeter fence is installed, FDK staff should encourage greater numbers of deer to be removed from the property under their state issued depredation permit. Increased deer removal can educate remaining deer that the airfield is not a safe place for them to loaf and forage.

Carnivores have been involved in 31% of mammal strikes reported to the FAA. Of the 658 strikes that involved carnivores, 13 (1.98%) resulted in substantial damage. Twenty-six red fox were observed within the perimeter fence during spotlight surveys. Fox activity can cause many problems at an airport. They can damage equipment by chewing, cause delays of air traffic, and damage aircraft in a collision. Fox and coyotes readily dig-out under perimeter fencing, which can create access points for other mammal species, such as white-tailed deer. Their medium body size (5-30 lbs.) can damage the landing gear of aircraft. Red fox are ranked 23rd on the FAA's list of hazardous species (FAA AC 150/5200 32 B). Loomacres staff documented a den site on FDK property during the WHA. The den was located west of the intersection of Taxiways Alpha and Bravo. Due to the abundance of red fox on the property and the identification of an active den, FDK staff should investigate adding red fox on their state depredation permit to lethally remove red fox. In addition, any perimeter fence that is installed at FDK should be constructed with a wildlife skirting material. Buried fencing can discourage wildlife from digging under a perimeter fence to gain access to the airfield. FAA CertAlert 16-03 outlines recommendations for perimeter fencing at airfields to exclude wildlife. Further recommendations on perimeter fencing are discussed in Chapter IV, Summary of Recommendations.

Table 7. Species, scientific name and count of mammals recorded during spotlight surveys at FDK.

Species	Scientific	Count
White-tailed deer	*Odocoileus virginianus*	147
Eastern Cottontail	*Sylvilagus floridanus*	2
Red Fox	*Vulpes vulpes*	26

2. Small Mammals

Small mammal populations fluctuate significantly depending on the time of year, quality of habitat, and predator populations. Small mammals require thick vegetation to provide protection from predators. Maintaining shorter grass can decrease the amount of small mammals that inhabit the airport. The airport should monitor for the presence of small mammals. A noticeable increase in avian predators and carnivores can be an indication that small mammal populations are increasing.

The impact of vegetation management on small mammal observations has been studied extensively in contexts other than airports. Wilkins and Schmidly (1979) found that small mammal abundance and diversity were positively related to plant diversity and groundcover; the least disturbed vegetative communities supported the most diverse plant and small mammal communities. Small mammals are not a direct threat to aviation. However, they also attract avian predators and large carnivorous mammals.

Grimm and Yahner (1988) also found that disturbance of roadside habitats reduced the abundance of most species of small mammals, primarily due to decreased vegetation height and density. This effect can be achieved through mowing (Wilkins and Schmidly 1979, Comely et al. 1983, Grimm and Yahner1988, Barras et al. 2000), grazing (Cornely et al. 1983), or herbicide application (Clark et al. 1996). In general, these studies support the findings that frequent mowing of vegetation will help minimize small mammal abundance on airports (Barras et al. 2000).

Two standardized small-mammal surveys were conducted on the FDK airfield during the WHA. One was carried out in April, and the other during September. See Appendix D for trap transect locations. No small mammals were collected during either survey. Due to the lack of small mammals collected during the survey, it is thought that the population is not considered an attraction on the FDK property during the time of the WHA. FDK staff should still monitor small mammal populations on airport property. Surveys can be conducted following standardized protocol as used in the WHA, or via observations of predator species abundance on the airfield. If a noticed increase in raptors, fox and coyotes occurs on the airfield, small mammal populations may be high. Whenever small mammal populations become a significant attractant, FDK staff should seek to reduce populations through either habitat management or pesticide application.

D. Owl Surveys

Owl surveys were conducted once a month during the WHA. Surveys were conducted between ½ hour after sunset and midnight. Electronic calls were used to detect owl presence at two survey locations on the airfield. The following species calls were played in this order during surveys; northern saw-whet owl (*Aegolius acadicus*), eastern screech owl (*Megascops asio*), barred owl (*Strix varia*), and great horned owl (*Bubo virginianus*). See Appendix E for a map of these survey locations. No owl species were detected during the surveys at FDK. Although no owls were recorded, it is still possible for them to be present on or around the airfield. Owls in general are large bodied birds that have the potential to cause substantial damages if struck. FDK staff should be aware of the possibility for them to occur. Environmental factors such as perching locations and food abundance can greatly affect the potential for owls to occur. As previously stated, FDK staff should monitor the small mammal population on the airfield.

E. Vegetation Surveys

Vegetation on airfields must not provide ample cover or be a preferred food source, loafing area, roosting location, or any other major attractant to birds and other wildlife.

1. Grass Heights

Grass height in airport habitats can often influence the amount of bird activity. Vegetation provides both a food source and cover for many bird species. Short grasses may attract geese,

gulls and flocks of blackbirds to an area, while longer grasses may produce more seeds attractive to other birds and potentially small mammals. The overall average grass height at FDK during the course of one year was 5.2 inches. Average grass heights for the entire airfield varied throughout the year, with taller averages noted during the summer and fall months (Figure 59). Grass heights can affect the overall attractiveness of the airfield to wildlife and prey species (insects and small mammals). The FAA recommends that grass heights within the perimeter fence be maintained between 6-12 inches to reduce the overall attraction (Cleary and Dickey 2010). During late fall, winter and early spring grass heights were below the FAA recommended heights. Shorter grass can become an attractant to blackbirds and waterfowl species. While snow cover can affect the overall height of the grasses on the airfield, FDK staff should attempt to maintain grasses within the FAA recommendations throughout the year.

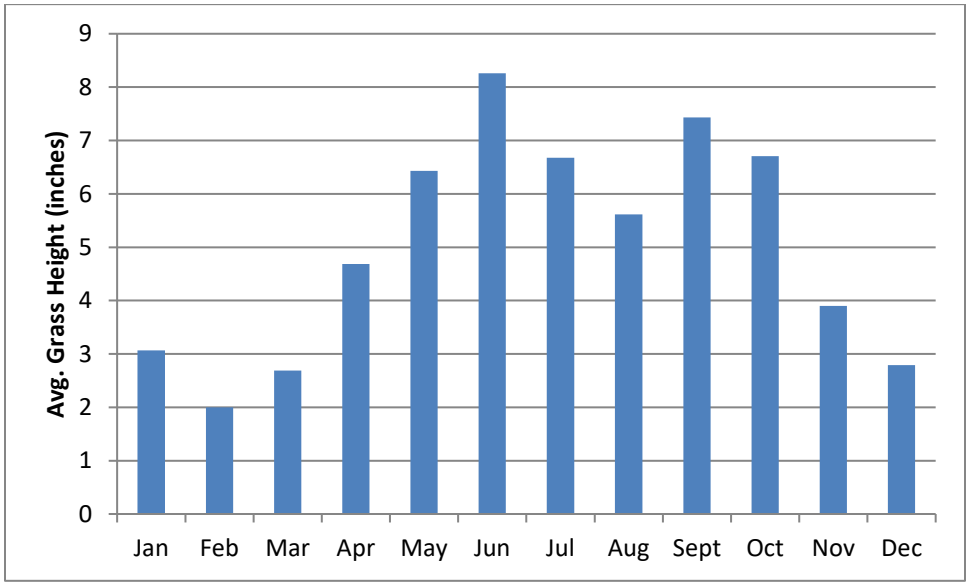


Figure 59. Average grass height at FDK by month.

Average grass heights for the entire year varied spatially on the airfield, with average heights the greatest near onsite survey point #3 (5.9 inches) and the lowest average height near onsite survey point #7 (3.1 inches). Given the abundance of blackbirds on the airfield, taller grass heights may assist in deterring flocks from attempting to forage.

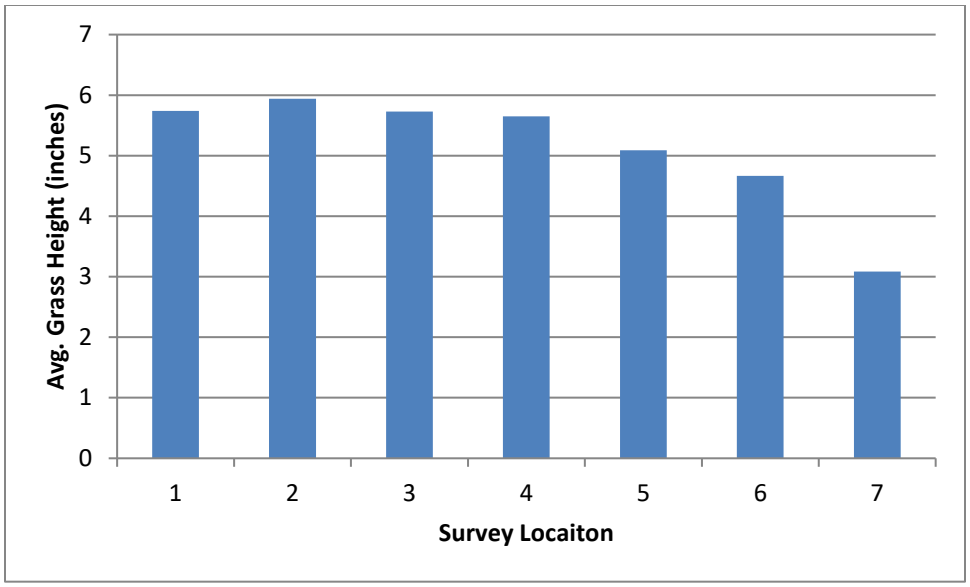


Figure 60. Average grass height at each onsite survey point at FDK for the course of one year.

2. Vegitation Surveys

Maintained grass fields are the dominant habitat type on the airfield. Species composition can have a significant effect on the attractiveness of habitats on and around the airfield. The dominant vegetation species and potential wildlife attraction was evaluated at all sites in which bird surveys were conducted. See Attachment A for an inventory of dominant vegetation at all onsite and offsite survey points.

F. Perimeter Fence

The FDK airfield does not have any perimeter fence surrounding the property to exclude wildlife. A portion of chain-link fence is located around the main ramp to limit public traffic onto the ramp, but does not have any gate limiting complete access. Due to the numerous deer sighted on the FDK airfield, Loomacres recommends that FDK investigate and install a complete perimeter fence to surround the property. In the FAA Cert-Alert 16-03, the FAA provides guidelines on the construction of a wildlife exclusion fence. A ten-foot tall fence, constructed of chain-link, woven wire, or v-mesh material should be installed with 3-strands of barb-wire on 45^{o} outriggers. The bottom of the fence should contain buried portion to exclude canids and discourage dig-outs. The bottom portion of the fence should be installed with a skirting material laid at a 45^{o} outwards, or buried several inches deep and laid horizontally for several feet and back-filled. A gate constructed in the fence line should have gaps no larger than 6 inches; and should contain a cement pad under the gate.

Once a perimeter fence is installed, FDK staff should begin monitoring the fence line on an ongoing basis. The monitoring will allow FDK staff to inspect for any gaps or voids that could allow wildlife entry to the airfield. FDK staff should also plan on performing vegetation

management along the perimeter fence. Grasses and shrubs that are allowed to grow on the fence can inhibit staff from observing wildlife outside the fence, and also cause structural issues with the fence line. A buffer of 50 feet should be maintained outside the perimeter fence from any brush or trees. To aid in monitoring the perimeter fence and access of the airfield, FDK should investigate the installation of a complete perimeter road around the airfield.

G. Onsite and Offsite Attractants

Loomacres personnel identified both onsite and offsite wildlife attractants throughout the course of the WHA, and Offsite survey sites were placed at major attractants. A review of both onsite and offsite attractants will be discussed in the results section of this report

1. Onsite Attractants

Wildlife is attracted to airfields for three main factors: food, water and shelter. At FDK all three of these elements are present and give cause for increased wildlife activity on the airfield. These attractants will be discussed and recommendations are provided to reduce the overall attractiveness of the airfield to wildlife

a. Food

Insects

Above ground insects were collected each month between April-November on FDK property to analyze and monitor the insect population. Insects are a potential food attractant for a variety of bird species such as blackbirds, gulls, swallows and shorebirds. The total number of insects collected on the airfield varied by month, with the greatest number of insects collected in May (Figure 61). Insect populations can fluctuate depending on a variety of environmental factors such as temperature, precipitation, and humidity. Overall insect counts were low throughout the assessment, with zero captures occurring in April, September, October, and November.

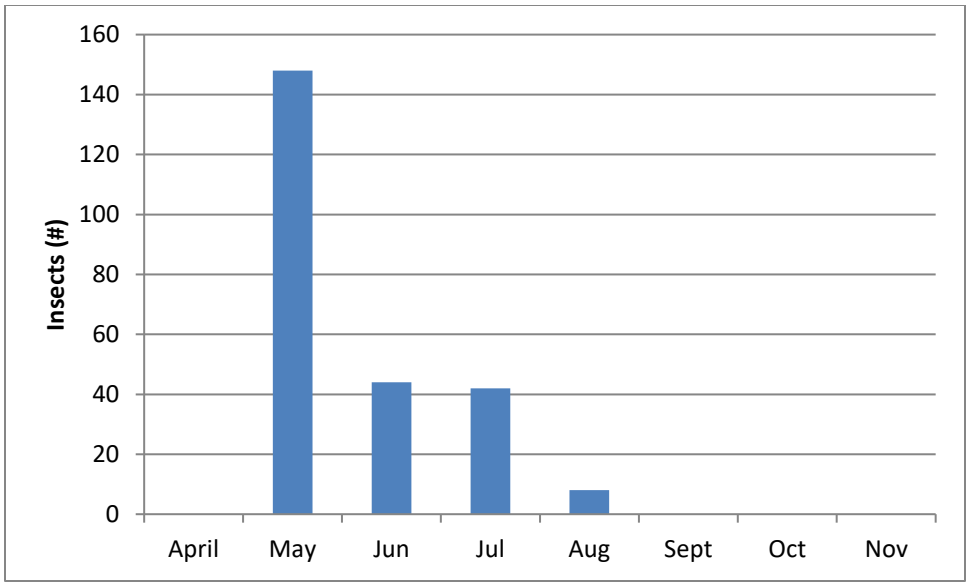


Figure 61. Total number of insects collected on FDK by month.

Insect diversity was relatively low during the WHA. The insects captured were counted and separated into the following groupings: Diptera (flies), Orthoptera (grasshoppers), Coleoptera (beetles), Hemipetera (leaf hoppers, aphids, & true bugs), Gryllidae (crickets) and Lepitdoptera (butterflies and moths). Orthoptera made up 42% of the total insect composition collected (Figure 62). Insects in the orders hemiptera, diptera and orthoptera are, in general, fed upon by several bird species. Increases in these orders on the airfield can lead to increased insectivore activity.

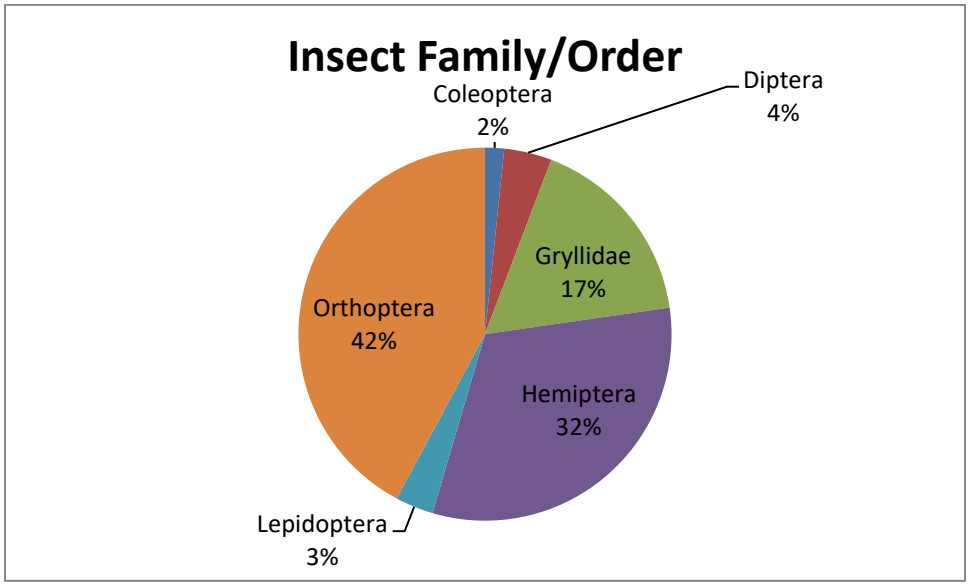


Figure 62. Percentage of insects collected for each family/order.

A Shannon-Weiner Index using $H= -\sum(p_i)(\ln p_i)$, where p_i is the proportion of each insect grouping (i.e. dipteral, coleoptera, etc.) was used to calculate diversity. The resulting H value

when using a Shannon-Weiner Index ranges from zero for a community with a single species, to over seven for a very diverse community. The overall index on the airfield was 1.34. Overall the insect diversity was low and relative abundance was low on the FDK airfield.

Insect populations should always be monitored and if there is an increase in birds feeding on the AOA, insect control is sometimes necessary. Airport staff should be aware of potential indicators pointing to a fluctuation in insect numbers. For example, large numbers of birds feeding behind mowers is an indication that insect numbers are high. If bird flocks become a hazard primarily during the time of vegetation management, airport staff may wish to mow later in the day or at night so as to not attract birds. As previously stated, the airport should discuss possible insecticide applications with famers should the need to reduce the population arise.

Vegetation

Overall, the majority of the movement area on the airfield is very well maintained and not considered attractive to wildlife. Grass heights on the airfield ranged below or near the minimum recommendation of 6 inches. Decreased grass heights can reduce cover and forage for insects and small mammals; however, they can also increase blackbird and waterfowl presence. FDK staff should aim to maintain their grass heights within the FAA recommended 6-12 inches.

Agriculture

Areas of the FDK airfield were utilized for agricultural operations during the WHA. Agriculture can be a significant attractant to hazardous wildlife such as waterfowl, blackbirds and white-tailed deer. Corn was the sole crop grown on the FDK airfield during the assessment. Overall, the corn fields were not noted to be highly attractive to flocks of blackbirds when ripening, nor a major attractant to flocks of Canada geese following harvest. White-tailed deer were observed foraging within the fields following harvest. Due to the absence of a perimeter fence at FDK, the deer foraging within the agricultural fields have the ability to enter the AOA and possibly strike aircraft. Installation of a perimeter fence will properly exclude white-tailed deer from the AOA. FDK staff should continue to monitor all agricultural operations on the airfield for any attraction to wildlife. Should flocks of birds be observed foraging within the fields, they should be immediate hazed from the area.

Other

Although small gravel is not a food source, it is used by many bird species as an aid for digestion. Mourning doves are commonly attracted to perimeter roads, where they ingest small pieces of gravel. Mourning doves should be harassed from the airfield whenever they are observed. Gravel and exposed soils can also serve as an attractant to killdeer. Killdeer readily nest in dry, open ground. Any unnecessary areas of exposed gravel should be covered with topsoil and seeded to encourage vegetative growth.

b. Water

Drainage Ditches

There are no areas of persistent standing water on the FDK airfield. Drainage ditches on the property were well maintained and did not hold standing water following rain events. FDK staff should continue to maintain all drainage ditches. If not-maintained, ditches have the potential to grow thick vegetation, which can provide cover and perching locations for wildlife. Thick vegetation can also inhibit proper drainage, leading to standing water.

Temporary Standing Water

Low lying areas within the infield have the potential to collect water following rain events. Temporary standing water within these depressions can be an attractant to a variety of wildlife. FDK staff should monitor the airfield for any low lying areas that are known to collect standing water and disperse any wildlife attempting to use the area. If water persists in the area, FDK staff should investigate re-grading the area or installing drainage to remove the water attractant.

c. Cover

Buildings

Loomacres staff monitored all buildings on airport property throughout the WHA for any potential access points or nesting areas for wildlife. Buildings can serve as nesting locations for a variety of birds, or simply provide shelter from the elements and predators. Any hangar or building on the airfield should be regularly monitored for wildlife activity. Species such as European starlings will nest within hangars, stagnant aircraft or any cavity on a building.

During the WHA, FDK staff had removed abandoned storage buildings on the southwest side of the airfield. During the beginning months of the assessment, this hangar was utilized by European starlings for roosting and nesting. Since its removal, starling observations had greatly decreased around the airfield.

Hangars remaining on the airfield can still attract wildlife. Airfield tenants should be informed of potential ways to reduce wildlife from using leased hangars, such as maintaining doors closed as often as possible or ensuring all seals on windows and doors are installed properly. If possible, airport staff should assist tenants with removal of wildlife. The Maryland State Police's hangar as noted for having starlings entering and exiting through a worn out door seal.

Perching

Approach lights, taxi, and runway lights are all potential perches for a variety of bird species, ranging from savannah sparrows to red-tailed hawks. The airport should be aware of this fact and take appropriate action to harass birds whenever they are observed utilizing these locations. To discourage perching, FDK should investigate installing anti-perching devices on hangars and the

terminal building. Any birds observed perching on the perimeter fence or equipment within the AOA should be constantly harassed to dissuade this behavior. Tall trees along the northern property border were noted to be used as perching locations for hawks and crows during the assessment. Any tall trees near approach and departure paths should be removed to discourage perching behaviors near these critical areas.

2. Offsite Attractants

a. Golf Courses

Golf courses are indentified as attracting habitats for hazardous wildlife around airfields. Loomacres surveyed the Clustered Spires Golf Course, located north of the airfield. Due to the close proximity of the golf course to the airfield, wildlife movements to and from the property can pose a direct hazard to aircraft using Runway 5/23. The Clustered Spires Golf Course has ample areas of short-maintained grasses surrounding small open water bodies. The Monocacy River runs between the airport property and golf course, which can attract various waterfowl species. Overall, bird counts were relatively low during the assessment, with small flocks of Canada geese and European starlings observed on the property. FDK staff should be aware of potential wildlife hazards traveling to and from the property. Communication should be established with the property owners to discuss wildlife hazards. If possible, FDK should encourage the property owners to conduct wildlife management on their property, including harassment of geese and blackbirds. Any management activities should be properly communicated with the airports ATCT prior to engaging to ensure that no wildlife is scared into the direction of moving aircraft.

b. Solid Waste Facility

Loomacres surveyed the County of Frederick Solid Waste Facility for its attraction to hazardous wildlife species. Surveys were conducted on the property edge due to access being denied from the property owners due to prior conversations with the FAA regarding wildlife. During the WHA, flocks of blackbirds and vultures were observed on and around the solid waste facilities property. A large flock (3000+ individuals) of European starlings was recorded at the site in September. Due to the presence of food wastes and abundance of birds recorded, FDK staff should be aware that increased wildlife activity can occur around the facility. Elevated concentrations of birds at the site have the potential to travel to the airfield in search of perching/roosting locations and food sources. FDK staff should open a line of communication with the operators of the property to discuss wildlife hazards. If possible, FDK staff should encourage the operators to conduct wildlife management on the property. FDK staff should also encourage the operators to inform FDK staff whenever large flocks (2500+ individuals) of birds are occurring on the site to notify air-traffic around the airfield.

c. Agriculture

Agricultural activities around the FDK airfield have the potential to attract various wildlife including blackbirds, columbids and waterfowl. Loomacres surveys a farm operation in close proximity to the airfield. The farm operation was also host to grain silos; which served as an attractant to moderate sized flocks of rock pigeons and European starlings. The FDK airfield is surrounded by several farms which have the potential to attract wildlife. Communication should be established with nearby farm owners to discuss wildlife hazards. FDK should encourage property owners to disperse flocks of Canada geese or blackbirds that may attempt to forage within their crop fields.

IV. Summary of Recommendations

A. Habitat Management

Because 71% of strikes occur under 500 feet altitude (above ground level), the greatest risk of bird strikes during flights occurs near the airport at takeoff or landing (Cleary et al. 2002). Accordingly, habitat management (Barras et al. 2000), direct control (Dolbeer 1986, Dolbeer et al. 1993b), and regulatory efforts (Cleary and Dolbeer 1999), for reducing wildlife strikes have focused on wildlife and their habitats on and near airports.

Grass heights

Studies to determine if tall vegetation reduced bird activity at airports in the USA have produced conflicting results. Buckley and McCarthy (1994) suggested that laughing gulls (*Leucophaeus atricilla*) used vegetation managed at 5 cm versus 5'45 cm. however, Barn et al. (2000) found no difference in bird use (all species) at these heights on the same airport and found that small mammal abundance tripled on un-mowed plots (>45 cm, Barras et al. 2000). This evidence stresses the importance of continued monitoring involving the height of the vegetation on the airport and the animals utilizing the resource. The airport should adjust their mowing and vegetation management strategy to meet their specific needs. For example, if Canada geese are becoming abundant, the airport should increase the height of vegetation; if large avian predator populations are increasing in response to small mammal populations the airport should decrease the vegetation height.

It is important that non-wildlife attracting vegetation is planted after construction projects. The airport should avoid all legumes (e.g., red clover) which are attractive to a variety of wildlife species, including white-tailed deer and Canada geese. Areas dominated by tall vegetation (e.g., goldenrod, brush, etc.) should be mowed and maintained to reduce cover for birds and mammals within the AOA.

Water

Drainage ditches and temporary standing water is the sole water attractants on the FDK property. FDK staff should continue to maintain vegetation within all drainage ditches to prevent the establishment of cover and insure proper drainage of water from the airfield. Areas of temporary standing water should be monitored following rain events to insure no wildlife attracted to the area. If water is persistent in low-lying areas, FDK staff should investigate regarding the area or installing proper drainage.

The Monocacy River runs along the northern edge of the airfield and is bordered by tall mature trees. The river is a potential attractant to a wide variety of waterfowl species. In addition, the mature trees along the banks of the river can provide cover and perching locations. FDK staff should be aware of potential wildlife traveling to and from the river. If possible, FDK staff should monitor the river for wildlife and haze any flocks when observed. FDK staff should also monitor these portions of the river for any Canada geese nesting activities.

B. Perimeter Fence

The airport should investigate installing a complete perimeter fence surrounding the airfield. Fencing installed should follow guidelines provided by the FAA in CertAlert 16-03 in regards to proper fence heights and buried portions preventing dig-outs. To aid in access in monitoring the perimeter fence, FDK should also install a perimeter road around the airfield. Once installed, FDK staff should routinely monitor the fence line for any gaps or holes. Vegetation along the fence line should be regularly maintained, with at least 50 foot buffer cleared on the outside of the fence. The buffer will allow for easy access for monitoring and help prevent damage from fallen trees on the fence.

C. Harassment and Control

The airport should continue their harassment and control efforts. Loomacres recommends that the airport continue to make regular patrols of the AOA to ensure that wildlife is not present. Airport personnel should survey and harass wildlife from the Monocacy River whenever possible. When harassment becomes less effective, it should be reinforced with lethal control. Removal of white-tailed deer from the airfield should be continued. FDK staff should discuss the addition of red fox to the airfield's state depredation permit. FDK staff should apply and obtain a USFWS Depredation at Airport permit to be authorized to remove hazardous migratory birds, such as Canada geese, mourning doves and red-tailed hawks.

D. Continuation of Monitoring

FDK staff should continue to monitor the presence of wildlife on the airport. This should be done monthly. The airport should use the protocol followed during the Wildlife Hazard Assessment, although they may modify the observation protocol to meet the airport needs and resources.

E. Record Keeping and Strike Reporting

Operations at FDK should continue to document wildlife observations and control work conducted. This data is valuable and it can be used to identify trends in wildlife activity. Strike reporting should be carried out using the FAA wildlife strike database. Loomacres will provide strike collection kits to the airport upon request and will assist with strike reporting if needed. Any significant strikes should be reviewed to address any needed changes or new management techniques to the airport wildlife control program.

F. Wildlife Coordinator

Loomacres recommends that the airport assign an individual to oversee the wildlife mitigation efforts at the airport. Ideally this person should have a background in airport wildlife mitigation. The person would be responsible for implementing the airport WHMP. This would include;

- Daily patrols and surveys
- Record collection and keeping
- Control work
- Training
- Annual review of wildlife hazard management program

G. Training

Airport staff that will be assigned to carry our wildlife mitigation should attend Airport Wildlife Hazard Management. Ideally, these staff should attend the training every 12 consecutive months. If the airport chooses to have members of their staff conduct lethal control they should also attend a specialized course that focuses on lethal wildlife removal and the use of firearms. The airport should emphasize the importance of wildlife identification training. Wildlife identification is an important factor in maintaining an effective Wildlife Management Plan. All staff should be trained in wildlife identification to reduce the percentage of unknown species present on the airport.

H. Offsite Attractants

The airport should continue to monitor offsite attractants to ensure that the populations of hazardous animals do not increase. The airport should develop an outreach program and work with the property owners to encourage their efforts at mitigating the wildlife hazards that exist on

their property. Should a property owner fail to reduce those hazards, the airport should increase their efforts by providing resources, or conduct harassment and control at these sites with the owner's permission.

Priority should be given to offsite locations closest to the airport with high populations of hazardous wildlife. Offsite locations 9 and 10 should be the first sites contacted.

I. Wildlife Hazard Working Group

The airport should establish a Wildlife Hazard Working Group (WHWG) that may include representatives from the following groups; airport operations and maintenance, Federal Aviation Administration (FAA), United States Fish and Wildlife Service, Maryland Department of Natural Resources, offsite landowners, and a qualified wildlife biologist, or any other stake holder the airport considers appropriate. At many general aviation airports, such as FDK, staff resources are limited, and do not have full time airport operations or maintenance personnel. Given the limited resources, the establishment of a meaningful working group can be difficult. Airport owners should attempt their best efforts to establish communication channels with stake-holding parties for possible future needs to discuss wildlife management strategies on and around the airfield.

J. Annual Review

The continued evaluation of an airport's wildlife mitigation program is vital to ensure continued success at reducing wildlife hazards on an airport. The airport should formally revise their WHMP at least once per year, or following a significant event, or land use change. Loomacres also recommends that the airport have a qualified airport biologist evaluate the airport wildlife mitigation program. The evaluation should include a complete survey of the onsite and offsite attractants, a review of permit use, review of strike reports, and an analysis of surveys completed by the airport and all incidental observations.

K. Recommended Equipment

- Nest removal/netting installation apparatus
- Paintball gun, for harassment of wildlife in areas that other techniques are not appropriate
- Lift equipment to remove nests from hangars
- Pyrotechnics and launchers
- Obtaining traps and equipment to remove animals

V. Airport Accomplishments

The airport is diligent in their efforts towards daily AOA wildlife patrols, harassment, and reinforcement control. Patrols are increased when wildlife activity increases.

The airport is maintaining vegetation within the AOA.

The airport takes a proactive approach at wildlife control by conducting work relating to problem species (i.e. white-tailed deer).

Airport staff is dedicated to mitigating wildlife issues on the airfield.

The airport has been pro-active in reducing onsite wildlife attractants, such as removing un-used hangars from the property.

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VII. Attachments

Attachment A

Checklist of the Vascular Flora of Frederick Municipal Airport (FDK)

Wildlife Significance Follows

Onsite Survey Points

Survey Point #1

Elymus hystrix, Bottlebrush grass
Elymus virginicus, Virginia wild rye
Plantago lanceolata, English plantain
Populus deltodies, Cottonwood
Schizachyrium scoparium, Little bluestem
Securigera varia, Crown vetch
Solidago spp., Goldenrod
Sorghastrum nutans, Indian grass
Taraxacum officinale, Common dandelion
Trifolium pretense, Red clover
Trifolium repens, White clover

Survey Point #2

Cichorium intybus, Chicory
Elymus hystrix, Bottlebrush grass
Elymus virginicus, Virginia wild rye
Festuca spp., Fescue
Plantago lanceolata, English plantain
Populus deltodies, Cottonwood
Schizachyrium scoparium, Little bluestem
Solidago spp., Goldenrod
Sorghastrum nutans, Indian grass
Taraxacum officinale, Common dandelion
Trifolium pretense, Red clover
Trifolium repens, White clover

Survey Point #3

Cichorium intybus, Chicory
Elymus hystrix, Bottlebrush grass
Elymus virginicus, Virginia wild rye
Festuca spp., Fescue
Plantago lanceolata, English plantain
Populus deltodies, Cottonwood
Schizachyrium scoparium, Little bluestem
Solidago spp., Goldenrod
Sorghastrum nutans, Indian grass
Taraxacum officinale, Common dandelion
Trifolium pretense, Red clover
Trifolium repens, White clover

Survey Point #4

Cichorium intybus, Chicory
Elymus hystrix, Bottlebrush grass
Elymus virginicus, Virginia wild rye
Festuca spp., Fescue
Plantago lanceolata, English plantain
Populus deltodies, Cottonwood
Schizachyrium scoparium, Little bluestem
Solidago spp., Goldenrod
Sorghastrum nutans, Indian grass
Taraxacum officinale, Common dandelion
Trifolium pretense, Red clover
Trifolium repens, White clover
Zea sp., Corn

Survey Point #5

Cichorium intybus, Chicory
Elymus hystrix, Bottlebrush grass
Elymus virginicus, Virginia wild rye
Festuca spp., Fescue
Plantago lanceolata, English plantain
Populus deltodies, Cottonwood
Schizachyrium scoparium, Little bluestem
Solidago spp., Goldenrod
Sorghastrum nutans, Indian grass
Taraxacum officinale, Common dandelion
Trifolium pretense, Red clover
Trifolium repens, White clover
Zea sp., Corn

Survey Point #6

Cichorium intybus, Chicory
Elymus hystrix, Bottlebrush grass
Elymus virginicus, Virginia wild rye
Festuca spp., Fescue
Plantago lanceolata, English plantain
Populus deltodies, Cottonwood
Schizachyrium scoparium, Little bluestem
Securigera varia, Crown vetch
Solidago spp., Goldenrod
Sorghastrum nutans, Indian grass
Taraxacum officinale, Common dandelion
Trifolium pretense, Red clover
Trifolium repens, White clover

Survey Point #7

Schizachyrium scoparium, Little bluestem
Taraxacum officinale, Common dandelion
Trifolium pretense, Red clover
Trifolium repens, White clover

Offsite Survey Points

Survey Point #8

Acer negundo, Boxelder
Amelanchier canadensis, Shadblow serviceberry
Elymus hystrix, Bottlebrush grass
Pinus strobus, White pine
Populus tremulodies, Quaking aspen
Plantus occidentalis, Sycamore
Poa sp., bluegrass
*Quercus rubra,*Red oak
Schizachyrium scoparium, Little bluestem
Sorghastrum nutans, Indian grass

Survey Point #9

Acer negundo, Boxelder
Cichorium intybus, Chicory
Impatiens capensis, jewelweed
Pinus strobus, White pine
Quercus alba, White oak
Schizachyrium scoparium, Little bluestem
Solidago spp., Goldenrod
Typha spp., Cattails

Offsite Survey Point #10

Schizachyrium scoparium, Little bluestem
Securigera varia, Crown vetch
Solidago spp., Goldenrod
Sorghastrum nutans, Indian grass

Offsite Survey Point #11

Acer rubrum, Red maple
Cichorium intybus, Chicory
Elymus hystrix, Bottlebrush grass
Quercus alba, White oak
Pinus virginiana, Virginia pine
Schizachyrium scoparium, Little bluestem
Solidago spp., Goldenrod
Sorghastrum nutans, Indian grass
Taraxacum officinale, Common dandelion
Zea sp, corn

Wildlife Significance

Acer negundo, Boxelder. Boxelder leaves and pedicels used in nest building. Samaras are eaten by turkey, quail, raccoon, squirrel, and deer. Boxelder provides important habitat for many wildlife in riparian areas.

Amelanchier canadensis, Shadblow serviceberry, fruit may be consumed by small birds, mice and squirrels. Seldom browsed by deer. Early bloom is important food source for pollinators. Fruit consumed by orioles, cardinals, thrushes, catbirds, woodpeckers, waxwings, robins, squirrels, and chipmunks.

Cichorium intybus, Chicory. Chicory is very attractive to deer and other wildlife.

Elymus hystrix, Bottlebrush grass. minor forage for bison and cattle. Consumed by mule deer. Very palatable winter forage for sheep. Seeds consumed by small birds, cottontails and jackrabbits.

Elymus virginicus, Virginia wild rye, palatable and nutritious to all livestock. Birds and small mammals will consume seeds and use fiber material for den and nests. Seed is utilized by mallards and lesser scaup when found in wetlands. Canada geese will graze young foliage.

Festuca sp., fescue, wildlife significance varies widely by species.

Impatiens capensis, jewelweed. Wildlife significance of this species is not reported.

Pinus strobus, white pine. This species provides cover for a variety of wildlife species.

Pinus virginiana, Virginia pine, squirrels and small birds will consume seeds from cones. Mature trees may be utilized for nesting and roosting.

Plantago lanceolata, English plantain. The leaves and seeds are eaten by birds and mammals.

Plantus occidentalis, sycamore, Use of the species by wildlife has not been reported.

Populus deltodies, Cottonwood. Bark and leaves of seedlings are consumed by field mice, rabbits, deer and domestic livestock. Provides habitat for many bird species. Beavers use wood for food and buildings. Has fair value for all wildlife, songbirds, upland game birds, fur and game mammals.

Populus tremulodies, Quaking aspen, terminal buds are browsed by white-tailed deer and upland game birds. Squirrels, small mammals and small birds will consume seeds. Highly sought by beaver.

Quercus alba, white oak, The young shoots of many eastern oak species are readily eaten by deer. Dried oak leaves are also occasionally eaten by white-tailed deer in the fall or winter. Acorns of white oak are considered choice food for many wildlife species, including the white-footed mouse, fox squirrel, black bear, pine mouse, red squirrel, and cottontail rabbits. The gray squirrel consumes white oak acorns but prefers the acorns of other oak species. Many birds, including the blue jay, northern bobwhite, mallard, ring-necked pheasant, greater prairie chicken, ruffed grouse, and wild turkey, eat white oak acorns.

Quercus rubra, Red oak. The young shoots of many eastern oak species are readily eaten by deer. Dried oak leaves are also occasionally eaten by white-tailed deer in the fall or winter. Acorns of white oak are considered choice food for many wildlife species, including the white-footed mouse, fox squirrel, black bear, pine mouse, red squirrel, and cottontail rabbits. The gray squirrel consumes white oak acorns but prefers the acorns of other oak species. Many birds, including the blue jay, northern bobwhite, mallard, ring-necked pheasant, greater prairie chicken, ruffed grouse, and wild turkey, eat white oak acorns.

Schizachyrium scoparium, Little bluestem. , young plants are considered good forage for ungulates. Provides excellent coverage for nesting and roosting habitat. Seeds are consumed by small mammals, upland game birds, rosy finches, and juncos.

Securigera varia, Crown vetch. Mammals readily graze the plant and it attracts a variety of wildlife.

Solidago spp., Goldenrod. The winter rosettes of leaves and immature plants are eaten by white-tailed deer, rabbits, prairie chickens, and wild turkey. Some small mammals and songbirds, especially the American goldfinch, consume the small achenes.

Sorghastrum nutans, Indian grass. Good forage for livestock and wildlife in the summer. Consumed by numerous songbirds and small mammals.

Taraxacum officinale, Common dandelion. seeds foraged on by small game birds. Herbaceous leaves can be consumed by geese and deer.

Trifolium pretense, Red clover Plants are nutritious and provide forage for cattle and white-tailed deer. Rabbits, numerous small mammals, wild turkey, prairie chickens, and ruffed grouse eat the herbage. Mourning dove, bobwhite quail, and ring-necked pleasant consume to a limited extent the small seeds. The plants also provide nectar for various species of butterflies.

Trifolium repens, White clover. Plants are nutritious and provide forage for cattle and white-tailed deer. Rabbits, numerous small mammals, wild turkey, prairie chickens, and ruffed grouse eat the herbage. Mourning dove, bobwhite quail, and ring-necked pleasant consume to a limited extent the small seeds. The plants also provide nectar for various species of butterflies.

Typha spp., cattail, used for nesting habitats for red-winged blackbirds and other small non game birds.

Zea sp., Corn. Corn can be highly attractive to a variety of wildlife species. Blackbirds and other flocking birds will forage on stalks when ripening. Deer, raccoon, opossum and bear will forage on grains. Migratory waterfowl will forage on waste grains left in fields following harvest.

VIII. Appendices

Appendix A

Maryland DNR Letter of Authority: Deer

MARYLAND DEPARTMENT OF NATURAL RESOURCES

WILDLIFE AND HERITAGE SERVICE

PERMIT/LICENSE

Effective: 01/01/2017	LETTER OF AUTHORITY - DEER	Expires: 12/31/2017

PERMIT #: 55463

Frederick Airport
ATTN: Rick Johnson
111 Airport Drive, East
FREDERICK, MD 21701

Work Phone: 301-600-2201
County of Residence:
Frederick

Location: Frederick Municipal Airport

Authority Statute(s): ACM 10-206

Regulation(s):

GENERAL CONDITIONS

Conditions in state law and regulations cited above, are hereby made a part of this permit/license. All activities authorized herein must be carried out in accord with and for the purposes described in the application submitted. Continued validity, or renewal, of this permit is subject to complete and timely compliance with all applicable conditions, including the filing of all required information and reports.

The validity of this permit is also conditioned upon strict observance of all applicable federal, local or other state laws.

This LOA is only valid for the site described on the face of the LOA. WEAPONS ALLOWED TO BE USED WILL BE LISTED BELOW UNDER SPECIAL CONDITIONS. DEER MAY BE TAKEN UNDER THE AUTHORITY OF THIS LOA 24 HOURS A DAY 7 DAYS A WEEK. LIGHTS MAY BE USED WHEN NIGHT TIME SHOOTING IS CONDUCTED UNDER THE AUTHORITY OF THIS PERMIT.

Deer taken under this LOA must be consumed by the permittee or a person named within the permit or donated to other individuals or charitable organizations for the purpose of consumption.

Agents shooting deer under authority of an LOA must wear a cap or vest of solid daylight fluorescent orange; or vest or jacket containing both front and back panels of at least 250 square inches each of solid daylight fluorescent orange; or an outer garment of camouflage fluorescent orange worn above the waist which contains at least 50 percent daylight fluorescent orange.

REPORTING INSTRUCTIONS:

Each deer taken under this authority must be reported within 24 hours of the time of harvest by calling 1-888-800-0121 or visiting the Internet site http://gamecheck.dnr.state.md.us. All agents listed on the LOA that are authorized to shoot deer must have a personal DNRid number that they use to check-in the deer that they harvest under authority of this permit. A DNRid number can be obtained at http://dnr.maryland.gov/service/getDNRidcard.asp or by visiting a local hunting license retailer. When checking a deer, the shooter will enter their DNRid number first, and then follow the prompts for deer taken under the authority of a Crop Damage Permit. They will use the permit number that is shown on the face of the permit in place of the crop damage permit number. Likewise, they should use the 3-digit shooter code that precedes their name at the end of this

ISSUED BY: Connie Roberts	PERMITS COORDINATOR	ISSUED: 01/09/2017

MARYLAND DEPARTMENT OF NATURAL RESOURCES

WILDLIFE AND HERITAGE SERVICE

PERMIT/LICENSE

Effective: 01/01/2017	**LETTER OF AUTHORITY - DEER**	Expires: 12/31/2017

PERMIT #: 55463

permit. Also during the check-in process, they should enter the correct county code, choose private land when asked if private or public, and enter the appropriate private land code. The county code and private land codes are listed on the map included with this permit. At the completion of the call or Internet visit a confirmation number will be issued that must be recorded on the included confirmation log sheets.

ANTLERED DEER: If an antlered deer (antler length over 3 inches from the base of the skull) is taken the permittee must take the antlers with a portion of the skull plate attached to the nearest Wildlife and Heritage Service office within 10 days.

TAGGING INSTRUCTIONS:

Each deer must be field-tagged with a shooter-provided tag that includes the LOA - number, shooter name and address, and county and date of harvest.

Failure to comply with the terms and conditions of this Permit may result in the issuance of citations from the Natural Resources Police. This LOA will not be renewed unless the permittee complies with all the terms and conditions of the permit.

An individual shooting under the authority of this LOA shall possess a copy of this LOA while acting under the authority of the LOA.

An individual is not eligible as a shooter on this LOA if the individual has been convicted of: (a) violating a provision of the Natural Resources Article, Title 10, Annotated Code of Maryland, within two years prior to the application date for this LOA; or (b) of any offense that disallows the individual from using a firearm.

An individual found guilty of a violation of any term or condition of this permit is guilty of a misdemeanor. Unless another penalty is specified provided elsewhere in the Natural Resources Article, the person, upon conviction, is subject to a fine not exceeding $1500 with costs imposed at the discretion of the court . The penalty applies for each deer killed over the authorized number, for disposing of deer in an unlawful manner, and for violating any of the special conditions of the permit.

This permit is not valid until signed. My signature affirms that I have read both pages of this LOA and understand the terms, guidelines and conditions of this Permit.

Permittee Name: Frederick Municipal Airport

Print Agents Name: Rick Johnson

Permittee Signature: RBJ

Agent Signature: _____

SPECIAL CONDITIONS

Permittee is authorized to remove 40 white-tailed deer that are creating a potential hazard to safe airport operations.

The permit number is the Telecheck number.

ISSUED BY:	Connie Roberts	PERMITS COORDINATOR	ISSUED:	01/09/2017

MARYLAND DEPARTMENT OF NATURAL RESOURCES

WILDLIFE AND HERITAGE SERVICE

PERMIT/LICENSE

Effective: 01/01/2017	**LETTER OF AUTHORITY - DEER**	Expires: 12/31/2017

PERMIT #: 55463

Authorized shooters: Harold Weller (001), Billy Weddle (002), Jim Twigg (003), Dale Stately (004), Brian Harrison (005), James Brown (006).

Shooting of deer is permitted using firearms (rifle or shotgun) and may only be conducted by the shooters authorized on the face of the LOA. NOTE: Shooting within 150 yards of an occupied structure is prohibited, unless the occupant gives written permission to the authorized agent and the LOD holder (Mr. Dougherty).

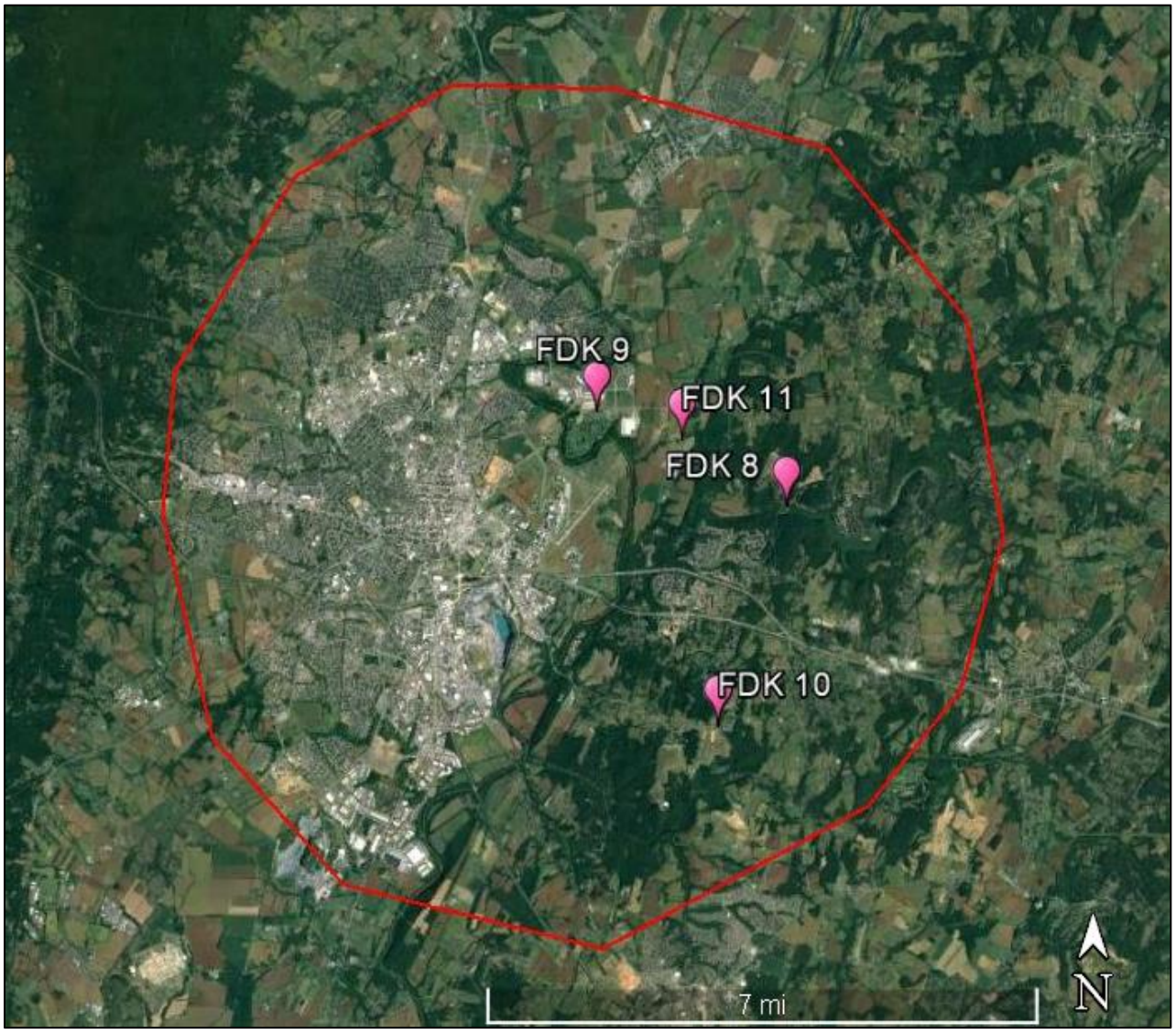
ISSUED BY:	Connie Roberts	PERMITS COORDINATOR	ISSUED:	01/09/2017

Appendix B

Map of Onsite Survey Locations

Appendix C

Map of Offsite Survey Locations and 5 Mile Perimeter



Appendix D

Map of Small Mammal Survey Locations

Appendix E

Map of Owl Survey Locations

Appendix F
Service Agreement and Qualifications

LOOMACRES
Wildlife Management

"Bringing wildlife management to a higher level"™

Statement of Qualifications to Conduct a Wildlife Hazard Assessment and Narrative Report for Frederick Municipal Airport

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- P r o f e s s i o n a l - R e l i a b l e - E t h i c a l -
Offices Nationwide

Table of Contents

LOOMACRES
Wildlife Management

It is with great pleasure that I provide this proposal for Wildlife Hazard Assessment services. Since 2005 Loomacres Wildlife Management's primary mission has been to provide airports and municipalities with the highest quality of wildlife management consulting available and we appreciate the opportunity to do the same for Frederick Municipal Airport.

Loomacres Inc. was created by Airport Wildlife Biologists and thus focuses solely on Airport Wildlife Management. Loomacres Wildlife Management Inc. guarantees that a Qualified Airport Wildlife Biologist who has conducted approved wildlife hazard assessments will be performing all services at all times. Our team has more FAA Qualified Biologists on staff than any other team in the country thus we are able to provide all services in house and at a lower cost than that of our competitors. Our biologists are able to immediately react to any unforeseen wildlife hazards with success. We understand the needs of airport managers to provide a safe environment for the operation of aircraft as well as understand the requirements that animals need. Often these problems collide creating an unsafe environment for people and wildlife. Our employees utilize their extensive experience and training in order to provide the utmost quality in wildlife management. They use innovative, sound, and ethical practices to help alleviate the risk to human health and safety

Animals are attracted to an area depending on several circumstances. Some of these include the availability of food, water and cover or more geographically significant features such as large bodies of water, mountain ranges or migratory routes. Each of these factors will have an effect on the type of species, their numbers and the time of year that they occur in your location. Being able to identify these conditions and the species associated with them is just the first step in our multilevel approach to wildlife management. Our team takes an integrated approach to wildlife management often referred to as Integrated Wildlife Management. We combine both active and passive management techniques.

In addition to passive and active management techniques utilized on site, we are also able to assist airports with offsite wildlife management to ensure, as per FAA AC 150/5200-33 Hazardous Wildlife Attractants on or near airports and AC 150/5200-34 Construction or establishment of landfills near public airports, that wildlife attractants within 5 miles of the airfield are limited. Other services Loomacres can provide but are not limited to include; New Construction and Building plan review, Wetland and Water Mitigation plan review, Wildlife and Insect Management Recommendations, and Airport Development and Expansion Plan review.

With experience conducting FAA Approved Wildlife Hazard Assessment, developing the Wildlife Hazard Management Plan and conducting annual Wildlife Hazard Management Training for airports across the county and in the FAA Eastern Region, we are familiar with the flora and fauna near 2W6 and the issues that they sometimes pose. All of our services have been approved by the FAA and have always been completed on schedule and at or under budget.

Through regular communication, monthly reports and quarterly meetings with the staff at Frederick Municipal Airport and Delta Airport Consultants, our team will be able to keep all informed of the success of the project and will be able to address any issues, concerns or updates.

Detailed descriptions of all above information can be found in the attached proposal. We look forward to establishing a relationship with Frederick Municipal Airport and continuing our relationship with Delta Airport Consultants.

Sincerely,

Cody Baciuska
Airport Wildlife Biologist
Vice-President
134 Markley Road, Suite 1
Cobleskill, NY 12043
(p)800-243-1462
(f)518-618-3129

LOOMACRES' EXPERIENCE:

Loomacres Wildlife Management was the first private company to be approved by the FAA to perform Wildlife Hazard Management services on airports. Since 2005, Loomacres Wildlife Management's primary mission has been to provide airports and municipalities with the highest quality of wildlife management consulting available. Loomacres Inc. was created by Airport Wildlife Biologists and thus focuses solely on Airport Wildlife Management. In 2008, Loomacres was incorporated as Loomacres Inc. (corporation) under the jurisdiction of New York, TIN # 26-3796424.

Loomacres Wildlife Management Inc. guarantees that a FAA Qualified Airport Wildlife Biologist who has conducted approved wildlife hazard assessments will be performing all biological services at all times. Loomacres has more FAA Qualified Airport Biologists on staff than any other firm in the country thus we are able to provide all services in house and at a lower cost than that of our competitors.

Our staff has experience conducting Wildlife Hazard Assessments for airports throughout the US thus are especially familiar with the flora and fauna throughout the state of Marland. With a local project office and experience throughout the US we will be within close driving distance of the project site which will keep travel costs at a minimum. This will allow for us to provide efficient and reliable service on short notice if any unforeseen conditions involving wildlife were to occur on the airfield. All of our Wildlife Hazard Assessments and Management Plans have been approved by the FAA thus we can, with confidence, guarantee an FAA approved product.

-List of Airports that Loomacres Inc. has provided Airport Wildlife Management Services, Consulting and/or Training;

Hagerstown Airport, Trenton Mercer Municipal, Raleigh County Memorial Airport, North Central West Virginia, Mid-Ohio Valley Regional, Salisbury-Ocean City Wicomico Regional, Delaware River and Bay Authority, Shenandoah Valley Regional, JFK International, Stewart International, LaGuardia International, Tulsa International, Charlotte-Douglass International, Canyonlands Airport, Fairchild Airforce Base, Cannon Airforce Base Newport Airport, Columbia Metropolitan Airport, Nashville International, Mcghee Tyson International, Chennault International, Anniston Metropolitan, Huntsville International, Little Rock International, Mahlon-Sweet Field Eugene, Buffalo International, Niagara Falls International, Gulfport-Biloxi, Havre Municipal, Riverton Regional, Rogers Municipal, Mena Intermountain, Teterboro International, Middle Georgia Regional, Republic, Saranac Lake Regional, Hancock County Bar Harbor, Sullivan County Municipal, Princess Juliana International Airport-St. Maarten, Jamestown International, Poconos Regional, Johnstown-Cambria County, Blair County, Plattsburgh International, Massena International, Ogdensburg International, Binghamton Regional, Elmira-Corning Regional, Ithaca-Tompkins Regional, Warren T. Eaton, Joslin Field-Magic Valley Regional, Palm Beach County, Lantana, Lebanon Regional, Manchester-Boston International, South Lafouche Airport, Houma Terrebone Airport, Hammond Northshore Regional Airport, Searcy Municipal, Stuttgart Municipal, Russellville Municipal, Guntersville Airport, Fort Worth-Meacham, Cleveland Municipal, Temple Airport, Northwest Alabama Airport, Syracuse International, Northwest Arkansas Regional Airport, Greenville-Spartanburg International Airport, Fayetteville-Drake Field Airport, Fort Smith Regional Airport, Owensboro-Daviess County Regional Airport, Bartlesville Municipal, Stillwater Regional,

Ponca City Regional, Columbia Regional Airport, Lawton-Fort Sill Regional Airport, Enid-Woodring Regional Airport, East Texas Regional Airport,.

WILDLIFE HAZARD ASSESSMENT EXPERIENCE:

The following is a list of just some of the airports that we have conducted Wildlife Hazard Assessments projects for during the last 5 years that **have been FAA Approved**. These include both 139 certificated airports as well as GA airports. In addition all of these projects included either the development or update of the airport's Wildlife Hazard Management Plan.

Tulsa International Airport, OK
Buffalo International Airport, NY
Nashville International Airport, TN
Little Rock National, AR
Owensboro-Daviess County, KY
Chennault International, LA
Republic Airport, NY
Hancock County Bar Harbor, ME
Sullivan County Airport, NY
Altoona-Blair County, PA
Lancaster Airport, PA
Ithaca-Tompkins Regional, NY
Niagara Falls International, NY
Lebanon Municipal, NH
Syracuse-Hancock, NY
Greenville-Spartanburg International, SC
Northwest Arkansas Regional, AR
Saranac Lake Regional, NY
Ogdensburg International, NY
Watertown International, NY
Fort Smith Regional, AR
North Central West Virginia Regional, WV
Mid-Ohio Valley Regional, WV
East Texas Regional, TX
Plattsburgh International, NY
Columbia Regional, MO
Houghton County Municipal, MI
Mcghee Tyson Knoxville, TN
Huntsville International Airport, AL

We have just recently completed and submitted the following Wildlife Hazard Assessments and are awaiting approval.

North County Airport (F45), FL
Lantana Airport (LNA), FL
Fayetteville Executive Airport, AR
Enid-Woodring, OK
Tunica Municipal, MS
Fort Worth Meacham, TX
Raleigh County Memorial Airport, WV

We are currently completing the following Wildlife Hazard Assessments:

Charlotte-Douglass International, NC
Shenandoah Valley Regional, VA
Trenton Municipal, NJ
Mahlon Sweet Field-Eugene, OR
Havre Municipal, MT
Riverton Regional Airport, WY
Trenton Municipal, NJ

TRAINING EXPERIENCE

Loomacres prides itself on its ability to train both airport staff and consultants in the industry. In addition to conducting annual Wildlife Management Training for airport personnel Loomacres is currently the only private company provider of Wildlife Hazard Management Training that acceptable to the FAA administrator for the training of Biologists who wish to conduct Wildlife Hazard Assessments as per AC 150/5200-36A. Furthermore, Loomacres offers an array of training courses for GA airports and for specific airport needs including live fire pyrotechnics training and NRA certified firearms training for airport personnel. Loomacres staff trains over 500 Aviation Professionals on an annual basis. Please see the Appendix II for a letter from the FAA confirming Loomacres' training qualifications.

AIRPORT WILDLIFE MITIGATION EXPERIENCE

Loomacres' staff is fully trained in airport wildlife mitigation methods. Our staff use both passive and active methods encompassed in Integrated Wildlife Management. Our staff is able to quickly identify and respond to wildlife hazards as they are identified during the course of our Wildlife Hazard Assessments. In addition to passive and active management techniques utilized on site, we are also able to assist airports with offsite wildlife management to ensure, as per FAA AC 150/5200-33b Hazardous Wildlife Attractants on or near airports and AC 150/5200-34 Construction or establishment of landfills near public airports, that wildlife attractants within 5 miles of the airfields are limited. Loomacres has several on-call and full time wildlife management service contracts in which we are responsible for coordinating and carrying out all wildlife management activities and act as a liaison between local landowners, government entities and the airports to ensure success.

Many of our activities involve public outreach and coordination with offsite property owners. We have successfully completed many projects that involve complex public relations and outreach programs. These have ranged from obtaining permission to conduct wildlife control to convincing property owners to implement their own wildlife mitigation programs.

REFERENCES

Three reference letters are included with this proposal, please see appendix VI.

Wildlife Hazard Assessment, Charlotte-Douglass International Airport, Charlotte SC
POC David J. Castaneda, Wildlife Coordinator, 704.574.6848, $62,000.00

Project Description: Loomacres, Inc. completed a Wildlife Hazard Assessment for the Charlotte-Douglass International Airport. Loomacres is also providing the airport with airport FAA required Wildlife Identification and Management Training.

Wildlife Hazard Assessment, North Central West Virginia Airport, Bridgeport, WV
POC Mark Heefner, Operations Manager, (304) 842-3400, Project Cost $59,000.00

Project Description: Loomacres, Inc. has completed a Wildlife Hazard Assessment for the North Central West Virginia Airport and updated the airport's Wildlife Hazard Management Plan. Loomacres has

provided the airport with FAA required Wildlife Identification and Management Training for the past 4 years. This WHA was completed during the fall of 2013.

Wildlife Hazard Assessment, Houghton County Memorial Airport, Hancock, MI
POC Dennis Jouppe, Airport Engineer/Project Manager, Peckham Engineering, 906-369-0666, Project Cost $49,445.00

Project Description: Loomacres, Inc. has completed a Wildlife Hazard Assessment for the Houghton County Memorial Airport. Loomacres has provided the airport with FAA required Wildlife Identification and Management Training. This project was completed during the fall of 2011.

Wildlife Hazard Assessment & Management Plan, Riverton Regional Airport, Riverton, WY
POC Paul Griffin, Assistant Manager, 307-856-7063, Project Cost: $73,211.00

Project Description: Loomacres is conducting a Wildlife Hazard Assessment for the Riverton Regional Airport. Loomacres will also create a Wildlife Hazard Management Plan and training for airport staff. This project is set to be completed in July of 2014.

Wildlife Hazard Assessment & Management Plan, Havre City-County Airport, Havre MT
POC Tom Lowe, Airport Manager, 406-262-3578 Project Cost: $73,940.00

Project Description: Loomacres is conducting a Wildlife Hazard Assessment for the Havre City-County Airport. Loomacres will also create a Wildlife Hazard Management Plan and provide training for airport staff. This project is set to be completed in September of 2014.

Wildlife Hazard Management and Related Services, Elmira-Corning Regional Airport, Elmira, NY
POC Bill DeGraw, Operation Manager 607-739-5613 ext.231

Project Description: Loomacres Inc. provides a part-time Airport Biologist to assist the airport in carrying out wildlife management activities. Loomacres' activities focus on managing marmot, coyote and deer populations that occur on or near the airport. Loomacres also provides the airport's staff with the FAA required Wildlife Hazard Management Training annually.

Wildlife Hazard Assessment/Prime Consultant, Buffalo-Niagara International Airport, Buffalo, NY
POC Dave Macy, Operations Director, 716-863-3586, $72,000.00

Project Description: Loomacres has been the prime consultant to the Buffalo-Niagara International Airport since 2006 providing annual FAA required Wildlife Identification and Management Training, consulting services and direct control work as needed. Loomacres is currently conducting a Wildlife Hazard Assessment for the airport and will be updating the airfields Wildlife Hazard Management Plan.

Wildlife Hazard Assessment, Owensboro-Daviess County Airport, Owensboro, KY
POC Rick Wells, Director of Facilities, 270-685-4179 Project $55,445.00

Project Description: Loomacres, Inc. has completed a Wildlife Hazard Assessment for the airport and created the airport's WHMP. Loomacres has provided the airport with FAA required Wildlife Identification and Management Training.

Wildlife Hazard Assessment, Northwest Arkansas Regional Airport, Bentonville, AR
POC Steven Keith, Operations Director, 479-790-9929. Project Cost: $62,098.00

Project Description: Loomacres, Inc. has completed a Wildlife Hazard Assessment for the Northwest Arkansas Regional Airport. Loomacres also provides the airport with FAA required Wildlife Identification and Management Training annually. Currently Loomacres acts as the Airport's oncall Wildlife Consultant. Our staff assists the airport with implementing their Wildlife Hazard Management Plan and coordinates with offsite stakeholder when harassment or population reduction occurs on or off the airport,

Wildlife Hazard Management Plan, Joslin Field-Magic Valley Regional Airport, Twin Falls, ID
POC Ed Lang, Operations Supervisor, 208-733-5215 ext. 1 Project Cost $7,100.00

Project Description: Loomacres Inc. has completed a Wildlife Hazard Management Plan for the airport.

Wildlife Hazard Assessment, Tulsa International Airport, Tulsa, OK
POC Ken Miller, Tulsa Airport Authority, 918-838-5085 Project Cost $88,945.00

Project Description: Loomacres Inc. has completed a Wildlife Hazard Assessment for the Tulsa International Airport. Loomacres will also update the airport's Wildlife Hazard Management Plan, and provides the airport's staff with FAA required wildlife hazard management training. Loomacres continues to have an Airport Biologist stationed onsite to provide daily oversight and implementation of the airport's wildlife hazard management plan.

Wildlife Hazard Assessment & Management Plan, Eugene Airport, Eugene OR
POC Scott Milovich, Deputy Airport Director, 541-682-5095 Project Cost $58,724.00

Project Description: Loomacres is conducting a Wildlife Hazard Assessment for the Eugene Airport. Loomacres will also create a Wildlife Hazard Management Plan and training for airport staff. This project is set to be completed in December of 2014

Wildlife Hazard Assessment and Related Services, Nashville International Airport, Nashville, TN
POC Chris Ricketts, Operations Coordinator, 615-218-3870 Project Cost $77,134.00

Project Description: Loomacres Inc. has completed a Wildlife Hazard Assessment for the Nashville International Airport (2011). Loomacres has also developed the airport's Wildlife Hazard Management Plan (2011). Loomacres continues to provide the airport's staff with the FAA required Wildlife Hazard Management Training annually and on-call wildlife management services.

Wildlife Hazard Assessment and Related Services, Huntsville International Airport, Huntsville, AL
POC Ryan Gardner, Operations Manager, 256-258-1201 Project Cost, $98,925.00

Project Description: Loomacres Inc. has an on-call Airport Wildlife Biologist stationed in Huntsville to assist the airport in carrying out wildlife management activities. Loomacres is also completed a Wildlife Hazard Assessment for the Huntsville International Airport (2012). Loomacres also developed the airport's Wildlife Hazard Management Plan. Loomacres has provided the airport's staff with the FAA required Wildlife Hazard Management Training annually.

Wildlife Hazard Assessment, Little Rock National Airport, Little Rock, AR
POC Charlie Jones, Operations Director, 501-372-3439 $82,000.00

Project Description: Loomacres, Inc. completed a Wildlife Hazard Assessment and Wildlife Hazard Management Plan for the Little Rock National Airport. Loomacres is also providing the airport with airport FAA required Wildlife Identification and Management Training. This project was for completion during the summer of 2013

Wildlife Hazard Assessment, McGhee Tyson Airport, Knoxville, TN
POC Bryan Rollins, Operations Manager, 865-342-3088, 74,000.00

Project Description: Loomacres Inc. has completed a Wildlife Hazard Assessment for the McGhee Tyson Airport. Loomacres also developed the airport's Wildlife Hazard Management Plan. Loomacres is providing the airport's staff with the FAA required Wildlife Hazard Management Training annually and assisting with wildlife control services.

Wildlife Hazard Assessment, Fort Smith Regional Airport, Fort Smith, AR
POC Mike Griffin, Operations Coordinator, 479-452-7000

Project Description: Loomacres, Inc. has completed a Wildlife Hazard Assessment for the Fort Smith Regional Airport. Loomacres has provided the airport with airport FAA required Wildlife Identification and Management Training.

Wildlife Hazard Assessment, Chennault International Airport, Lake Charles, LA
POC Cortez Gallien, Director of Operations, 337-513-2514

Project Description: Loomacres, Inc. has completed the field work necessary for a Wildlife Hazard Assessment for the Chennault International Airport. Loomacres also be provides direct control assistance and FAA annual Wildlife Hazard Management Training. This project was completed in the spring of 2012.

QUALIFICATIONS OF KEY STAFF:

Loomacres Inc. puts its reputation in the selection and the performance of our employees. Loomacres Inc. is proud that it has more FAA qualified wildlife biologists on staff than any other firm in the country. Additionally, Loomacres is the only private sector company that is approved by the FAA to conduct the training required to qualify Airport Wildlife Biologists. Loomacres Inc. currently utilizes the skills of several in-house FAA Qualified Airport Wildlife Biologists. Loomacres Wildlife Management's biologists include the first non- governmental wildlife biologist qualified by the FAA, Cody L. Baciuska, who will be the supervisory airport wildlife biologist overseeing all services and will be supported by nine additional FAA qualified Airport biologists for this project. All of the personnel that will be operating on the airports have extensive experience conducting wildlife conflict resolution at airports and are FAA qualified airport biologist. Please see Appendix I and II for letters confirming Loomacres Qualifications.

Kristin Baciuska, (Co-Founder, President, & Qualified Airport Wildlife Biologist)- Biologist Kristin Baciuska has been with Loomacres since it was established in 2005. Kristin has a diverse background in the biological sciences to include fisheries and wildlife, wetlands and plant science. Kristin holds a Master's of Science degree in Biology and has completed a FAA grant funded research project titled "Native and Naturalized Grasses Suitable for use on Airports Managed for Wildlife". Kristin has presented

her research at numerous venues including the 2009 & 2010 USA/Canada Bird Strike Conferences as well as the 2009 Wildlife Damage Management Conference. Kristin's research in the plant sciences has made her a valuable asset to our company in her ability to assess both vegetation and habitat on and around airports. Kristin is confident in her ability to make vegetation management and planting recommendations to airfields across the United States. In addition to her graduate work, Kristin has taken numerous continuing education credits in the wetland sciences at Rutgers University and is a certified wetland delineator as well as a Certified Commercial Pesticide Applicator. Kristin's previous employers include USDA Wildlife Services and several landscape architects. Kristin Baciuska exceeds the requirements outlined in AC No: 150/5200-36A. Please see the Appendix III for further information regarding Mrs. Baciuska's qualifications.

Cody Baciuska, (Co-Founder, Vice President, & Qualified Airport Wildlife Biologist)-All Loomacres Inc. employees work under the direct supervision Cody Baciuska. Mr. Baciuska has conducted Wildlife Hazard Assessments, developed Wildlife Hazard Management Plans, and has conducted numerous airport related research studies. Mr. Baciuska has provided wildlife hazard mitigation for some of the largest airports in the United States; including John F. Kennedy International Airport, Nashville International Airport and LaGuardia International Airport. In addition to being a FAA qualified Airport Wildlife Biologist; Mr. Baciuska sits on the Birdstrike USA Steering Committee, and is a member of the National Wildlife Control Operators Association, the Wildlife Society and is the current president of the NYS Wildlife Management Association. In addition, Mr. Baciuska is a certified National Rifle Association firearms instructor. Mr. Baciuska will be the primary Biologist overseeing all services. Mr. Baciuska exceeds the requirements outlined in AC No: 150/5200-36A. Please see the Appendix III for further information regarding Mr. Baciuska's qualifications.

Bill Antonides SAB (Senior Airport Wildlife Biologist)- Bill Antonides was employed for 22 years as a wildlife conservation officer for the South Dakota Department of Game, Fish and Parks. His job required extensive land and wildlife management work on both public and private land. After retiring from the Game, Fish and Parks Department, Bill pursued other career interests, including work at airports as a wildlife hazard management specialist and qualified airport wildlife biologist. Bill has years of experience conducting WHA's and creating WHMP's. Prior to joining Loomacres as a Staff-Senior Airport Biologist, Antonides conducted Wildlife Hazard Assessments for Brookings Regional Airport SD, Aberdeen Airport SD, Kearney Airport NE, and Yellowstone Airport. Furthermore, Bill has experience heading up Wildlife Hazards Working Groups consisting of airport personnel, fixed-base operators, law enforcement officials, and city and county planners and has been tasked with annually reviewing WHMP's and progress on the recommendations of WHA's. Bill is also an instructor for the annual airport wildlife hazard management training required by the FAA. Please see the Appendix III for further information regarding Mr. Antonides's qualifications. Bill has been employed with Loomacres for the past 4 years.

Mat Natali, AB (Qualified Airport Wildlife Biologist)- Biologist Mat Natali has a Bachelor's degree in Wildlife Biology from the University of Pittsburgh and has ample experience conducting Wildlife Hazard Assessments, trainings and control work for airports throughout the southern US. Mat has also conducted several FAA qualified airport wildlife management training courses. Mat has excellent wildlife identification skills and is keen at identifying habitat types that may attract wildlife on airfields. Mat is familiar with and experienced in the safety and security procedures required when operating on an airfield and has airport driving experience. Please see the Appendix III for further information regarding Mr Natali's qualifications. Mat has been employed with Loomacres for the past 5 years.

Shawn Ferdinand, AB (Qualified Airport Wildlife Biologist)- Shawn Ferdinand holds Bachelors degrees in Environmental Science and in Wildlife Management from the State University of New York. Shawn has field experience in all aspects of airport wildlife management and, as part of Loomacres, Shawn has conducted and written several FAA approved Wildlife Hazard Assessments for airports across the US. Shawn has also helped create several FAA approved Wildlife Hazard Management Plans and conducted several Wildlife Hazard Management Training Courses. Shawn has drafted rare species accounts to contribute to the Species of Greatest Conservation Need list and has experience with all types of permitting, bird banding and conducting all types of biological surveys. Shawn is also familiar with airport driving and security procedures. Please see the Appendix III for further information regarding Mr. Ferdinands qualifications. Shawn has been employed with Loomacres for the past 2 years.

Jon Wills AB (Qualified Airport Wildlife Biologist)- Jon earned a bachelor's degree in Wildlife Biology from Murray State University. After graduating, he gained valuable field experience in deer telemetry, vegetation sampling and deer management. Prior to joining Loomacres, Jon was employed by Colorado Parks and Wildlife where he worked with wild turkey and swift fox. Jon is knowledgeable in the ecology of many wildlife species and has experience working with private land owners. As part of the Loomacres team Jon uses his extensive field experience to carry out wildlife management services. Jon has airport driving experience and is familiar with airport security procedures. Please see the Appendix III for further information regarding Mr. Wills qualifications. John has been employed with Loomacres for the past three years.

Ted Igleheart AB (Qualified Airport Wildlife Biologist)- Wildlife Biologist Ted Igleheart has been assisting Loomacres Wildlife Management since 2005. Ted has worked on several Wildlife Hazard Assessment Projects and lives and works out of Worland, WY. Ted holds degrees in Wildlife Management and Ecology from the University of Kentucky and the University of Maine. As a BLM Wildlife Biologist Ted has experience conducting endangered species surveys.. Prior to joining Loomacres Ted also worked for USDA Wildlife Services and the Maine Department of Inland Fisheries and Wildlife. Please see the Appendix III for further information regarding Mr. Iglehearts's qualifications. Ted has been employed with Loomacres for the past two years.

STAFFING STRUCTURE:

Staff assigned to this project will be working out of two offices; Our headquarters located in New York and our Regional office located in KY. The Airport Biologist (SAB) will work out of the NY office, while the support staff will work out of our KY office. The addresses are listed below.

Headquarters:
134 Markley Road, Suite 1
Cobleskill, NY 12043

Regional Office:
2673 Outer Loop
Louisville, KY 40219

Our Airport Biologists are never assigned more than 4 projects at a time. Our depth of staff allows for an alternative Qualified Airport Wildlife Biologist to assist the Qualified Airport Wildlife Biologists assigned to this project in the event of illness or another similar situation. This ensures that your project will be given the upmost attention and that all tasks will be completed on time.

The Senior Airport Biologist will be responsible for the day to day management of the project, conduct research, and perform surveys. The biologist will be traveling by car to the airport. They will be supported by the Airport Biologist who will carry out research and conduct surveys. Three additional Qualified Airport Biologists will act as backups to ensure continuity of the project. Below you will find a diagram of the staffing structure for this project. No sub-contractors will be used.

SUMMARY OF EXISTING & PROPOSED COMMITMENTS FOR KEY STAFF:

Other commitments of key staff members proposed for this project are summarized in this section of our proposal. The table below summarizes the existing commitments and those proposed for each key member of the team on a percentage of time within each calendar year of the project. As shown, key members of our staff, will have ample time available to devote to this project. Three of the biologists assigned to this project will act as backups should the primary biologists be indisposed for any reason. Each backup, although not working on the project on a daily basis will remain updated with the project and participate in all meetings.

Summary of the Existing Commitments and the Level of Effort Proposed on THE WHA Project				
Key Team Members	Existing and Propo ed Commitments for each Calendar Year			
	2014		2015	
	Existing	WHA	Existing	WHA
K. Baciuska	60	2	40	2
C. Baciuska	45	2	45	2
B. Antonides	25	25	25	25
S. Ferdinand	25	25	25	25
M. Natali	50	Backup	50	Backup
T. Igleheart	10	Backup	0	Backup
J. Wills	25	Backup	25	Backup

TECHNICAL APPROACH:

Loomacres' staff will conduct a Wildlife Hazard Assessment, and develop/update Wildlife Hazard Management Plan (optional) as required by the FAA, Title 14 139.337(b) (1-4), and in accordance to the current version of Advisory Circular 150/5200-33, and all other relevant AC's, Cert-Alerts, Bulletins and Publications. All of the field work (100%) provided as part of this project will be carried out by FAA Qualified Wildlife Biologists. This section describes the specific activities that will be completed for the Wildlife Hazard Assessment. A detailed schedule for individual tasks

and deliverables will be discussed in the next section. We can adjust the scope as required by the Airport as long as the minimum FAA requirements are met.

WILDLIFE HAZARD ASSESSMENT:

I. Avian surveys will be conducted to document the species, number, habitat use and seasonal activity of birds that inhabit the airport. The surveys will be conducted four times monthly and will continue for one year. The surveys will be conducted at sites located on and adjacent to the airport property. Site selection will be determined at the start of the project. 8-10 sites will be selected onsite and approximately the same amount will be selected offsite. During the surveys each of the sites will be visited for 3 minutes. The birds that are observed during this time will be documented. The results will be analyzed and included in the final WHA reports.

II. Large mammal surveys will be conducted 2 times per month. Spotlights/Night vision/Infra-red will be used to document the abundance and distribution of mammals. A vehicle will be used to survey the AOA and surrounding property. The route the vehicle will travel will be determined during the first visit to the airport. The results will be analyzed and included in the final WHA reports.

III. Small mammal surveys will be conducted during the spring and fall at each airport to document the small mammal population at the airports. two, 1000 ft, transects will be set up in varying habitat types within the airport property. Small mammal traps will be placed every ten feet along each of the transects. The transects will be set for a total of three nights. Each day the traps will be checked and the species caught will be recorded. The results will be analyzed and included in the final WHA reports.

IV. Loomacres Inc. staff will also document all major wildlife attractants and wildlife hazards at the airports and within 5 miles of the airports. This data and mitigation recommendations will be presented in the final WHA reports.

V. The Wildlife Hazard Assessment will also analyze the history of bird strikes that have occurred at the airports and the circumstances that lead to the initiation of the Wildlife Hazard Assessments.

VI. A review of all wildlife-associated permits will be assessed and a historical review of their use will be presented in the Wildlife Hazard Assessments.

VII. Two months after completing the field work the findings of the surveys, and all above mentioned will be compiled into FAA approved WHA reports and will be presented to the airport. The report will also include a description of any potential wildlife hazards observed on and around the airport. In addition, the report will provide recommendations for reducing identified wildlife and their potential for causing wildlife strikes, and make recommendations for mitigating the wildlife attractants found on and around the airport.

VIII. In the event of a wildlife/bird strike, Loomacres Inc. will assist airport personnel with the identification of the animal struck. Loomacres Inc. will also aid in the reporting of the strike.

IX. When necessary, Loomacres Inc. can assist with public relations. This includes public out-reach, and media relations. In addition, Loomacres Inc. will assist in acquiring land owner permission in

the immediate area surrounding the airport in order to conduct surveys and wildlife conflict resolution.

PHASE II WILDLIFE HAZARD MANAGEMENT PLAN:

Upon completion of the Wildlife Hazard Assessment, Loomacres Inc. will be available to create/update the Wildlife Hazard Management Plan. Loomacres Inc. will develop the Wildlife Hazard Management Plan so that it will meet the requirements of FAA, Title 14 Part 139.337 (e) & (f)

I. Following the completion of the Wildlife Hazard Assessment Loomacres Inc. will develop the Wildlife Hazard Management Plan for the airport. The WHMP's will be based on the data gathered during the Wildlife Hazard Assessment. A Wildlife Hazard Management Plan provides detailed procedures and guidelines for the airport to address wildlife hazards at the airport. It will also prioritize the goals of the plan and sets a timeline for the accomplishment of the goals. The plan will recognize the people that will carry out the established goals and will take into account any habitat modifications and land use changes. Loomacres will include all necessary information regarding Local, State and Federal depredation permits. The plan will recommend vegetation management taking into account any threatened and endangered species determined to be on the airfield. This plan will include methods for regularly updating the existing plan annually or in the event of a new hazard involving wildlife arises. The plan will also outline the required annual dates of FAA Wildlife Hazard Management and Wildlife Identification Training and will provide an outline that Loomacres Inc. covers during its annual Airport Wildlife Hazard Management Training courses.

TERM:

Due to the time sensitive nature of FAA requirements and the importance of reducing potential wildlife hazards, Loomacres Inc. is available to initiate this project at the Airports' earliest convenience. The proposed term of the agreement will begin on signing of this proposal and conclude fifteen months later.

ESTIMATED WORK SCHEDULE

Below you will find a work schedule. The schedule was based on a projected start date of February 1 2015. This can be adjusted to meet the needs of the airport. Also included is a summary of hours for each major task and associated staff member.

Schedule of Major Tasks, Milestones and Deliverables for FDK

Task	Primary Staff	2015-2016 F M A M J J A S O N D J F M A
Meetings:		
Startup Meeting	SAB,AB	
Quarterly Meetings	SAB,AB	
Final Meeting	SAB,AB	
Project Setup:		
Survey Site Selection	SAB,AB	
Site Specific Driver Training	AB	
Site Specific Security Clearance	AB	
Review of Wildlife Permits	SAB,AB	
Field Work and Data Collection:		
Wildlife Conflict Resolution/Control	AB	
Avian Surveys	AB	
Large Mammal Surveys	AB	
Owl Surveys	AB	
Two Small Mammal Surveys	AB	
Survey of Wildlife Attractants	AB	
Strike History Analysis	SAB	
Vegetation Surveys	AB	
Milestones/Deliverables:		
Monthly Reports	SAB	
Draft WHA Submitted	SAB,AB	
Final WHA Report Submitted	SAB,AB	
Draft of WHMP	SAB,AB	
Final WHMP	SAB,AB	

ADDITIONAL EQUIPMENT

Additional equipment is considered equipment that was purchased directly for this project. These items may include; traps, pyrotechnics, exclusion devices, and wildlife dispersal equipment. The cost of these items will be billed in addition to the phase I &II totals.

LICENSES AND PERMITS:

Loomacres Inc. maintains all necessary permits and licenses to conduct wildlife management activities on airports Loomacres Inc. should be listed as a sub-permittee on all appropriate permits. Loomacres Inc. will act as a liaison with both State and Federal agencies to assist the airport with necessary application, permitting and reporting procedures. Loomacres Inc. will assist airport personnel with the maintenance and renewal of Wildlife Permits.

INSURANCE:

Loomacres Inc. maintains liability insurance coverage consisting of 2,000,000.00 per incident, 4,000,000.00 aggregate and an additional 2,000,000 umbrella policy. We also carry 2,000,000 in professional, 1,000,000 in vehicle, and 500,000 in workmen's comp. If additional insurance is required Loomacres Inc. will acquire and present appropriate documentation prior to the start of this project. Please see Appendix V for Insurance Accord.

SECURITY AND VEHICLE OPERATION:

All personnel that will be assigned to this project are trained on the safety and security procedures that must be followed at all times while working on airports. All personnel have previous experience operating vehicles unescorted on all movement areas within the AOA. Loomacres is willing to provide extensive details on personal and company backgrounds and agrees to submit to criminal history record checks.

DBE:

Loomacres Wildlife Management is a small women-owned business.

OTHER INFORMATION:

- ***Please note that the information contained in this proposal is confidential and propitiatory and should only by viewed by the intended recipient and or the potential client. The information contained in this proposal should not be used for any proposal or project without written permission from Loomacres Inc. We ask that if our proposal is not accepted all information that is contained within be destroyed and not distributed for any reason.***

- ***Through income from our active projects and backing from private investors, Loomacres Inc. has the financial resources to adapt to unforeseen situations. Loomacres Inc. guarantees the ability to provide all necessary equipment and human resources that are required to fulfill current and future contracts.***

Respectfully Submitted;

Cody Baciuska
Vice-President
Loomacres Inc. (dba Loomacres Wildlife Management)
134 Markley Road, Suite 1
Cobleskill, NY 12187
800-243-1462

APPENDIX I: FAA QUALIFICATION LETTER

LOOMACRES
Wildlife Management

Dear Airport/Operations Manager,

This letter was prepared to provide the Certificate Holder with documentation verifying that Loomacres' personnel meet the requirements of §139.337(c), & (f)(7) outlined in AC No: 150/5200-36a (§6e).

(1) The Trainer/qualified airport wildlife biologist has the necessary academic coursework from accredited institutions and work experience to meet the qualifications of a GS-0486 series wildlife biologist as defined by the U.S. Office of Personnel Management classification standards.

(2) The Trainer/qualified airport wildlife biologist has taken and passed an airport wildlife hazard management training course acceptable to the FAA Administrator.

(3) The Trainer/qualified airport wildlife biologist has while working under the direct supervision of a qualified airport wildlife biologist, has conducted at least one or more Wildlife Hazard Assessments acceptable to the FAA Administrator.

(4) The Trainer/qualified airport wildlife biologist has successfully completed at least one of the following within five years of their initial FAA approved airport wildlife hazard management training course,

(i) An airport wildlife hazard management training course that is acceptable to the FAA Administrator or,

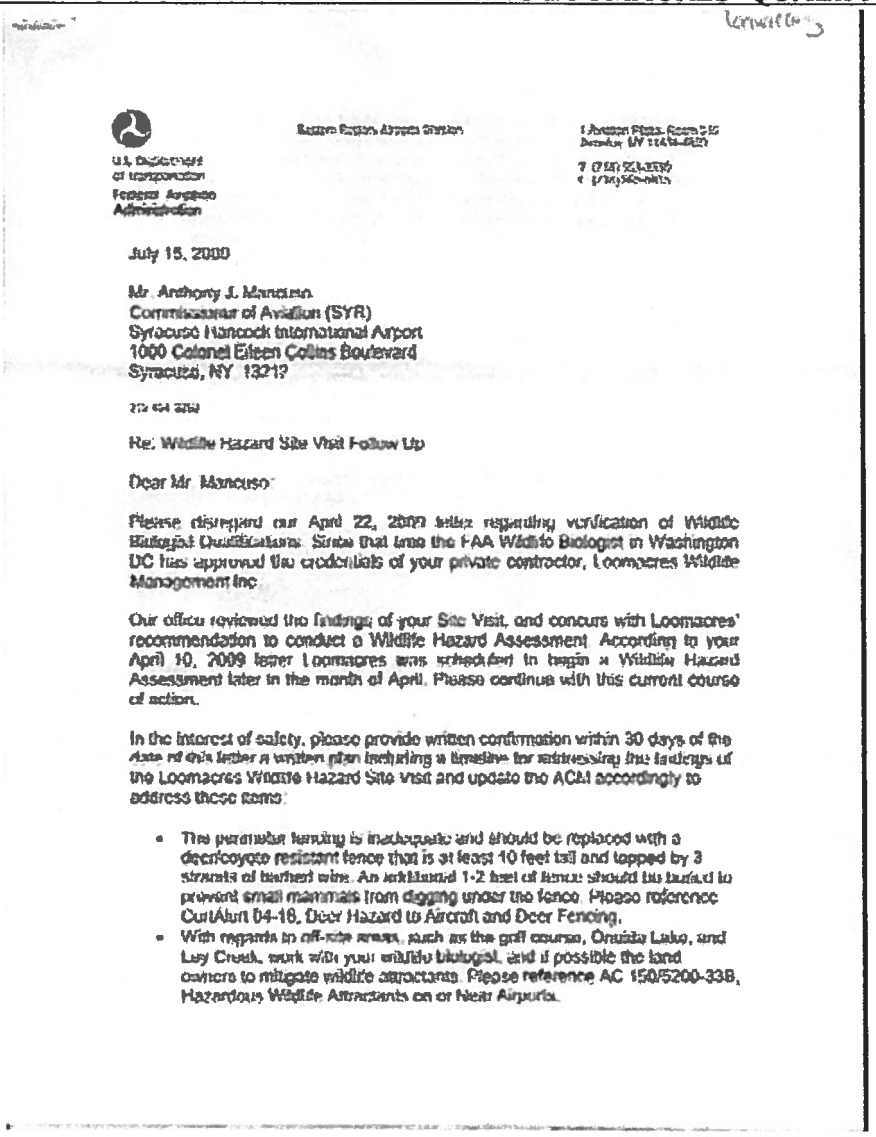
(ii) Attendance, as a registered participant, at a joint Bird Strike Committee–USA/Bird Strike Committee–Canada annual meeting.

Sincerely,

Cody Baciuska
Vice- President

- P r o f e s s i o n a l - R e l i a b l e - E t h i c a l -

APPENDIX II: LETTERS FROM THE FAA CONFIRMING LOOMACRES' QUALIFICATIONS



U.S. Department of Transportation
Federal Aviation Administration

July 15, 2009

Mr. Anthony J. Mancuso
Commissioner of Aviation (SYR)
Syracuse Hancock International Airport
1000 Colonel Eileen Collins Boulevard
Syracuse, NY 13212

Re: Wildlife Hazard Site Visit Follow Up

Dear Mr. Mancuso:

Please disregard our April 22, 2009 letter regarding verification of Wildlife Biologist Qualifications. Since that time the FAA Wildlife Biologist in Washington DC has approved the credentials of your private contractor, Loomacres Wildlife Management Inc.

Our office reviewed the findings of your Site Visit, and concurs with Loomacres' recommendation to conduct a Wildlife Hazard Assessment. According to your April 10, 2009 letter Loomacres was scheduled to begin a Wildlife Hazard Assessment later in the month of April. Please continue with this current course of action.

In the interest of safety, please provide written confirmation within 30 days of the date of this letter a written plan including a timeline for addressing the findings of the Loomacres Wildlife Hazard Site Visit and update the ACAI accordingly to address these items:

- The perimeter fencing is inadequate and should be replaced with a deer/coyote resistant fence that is at least 10 feet tall and topped by 3 strands of barbed wire. An additional 1-2 feet of fence should be buried to prevent small mammals from digging under the fence. Please reference CertAlert 04-18, Deer Hazard to Aircraft and Deer Fencing.
- With regards to off-site areas, such as the golf course, Onuida Lake, and Ley Creek, work with your wildlife biologist, and if possible the land owners to mitigate wildlife attractants. Please reference AC 150/5200-33B, Hazardous Wildlife Attractants on or Near Airports.

Cody@loomacres.com

From:	AmyAnderson@faa.gov
Sent:	Friday, July 13, 2012 3:23 PM
To:	Cody Baduska
Cc:	JohnWeller@faa.gov
Subject:	Airport Biologist Training Course

Cody,

The Airport Biologist Training Course that you submitted meets the criteria in FAA Advisory Circular 150/5200-36A, Qualifications for Wildlife Biologist Conducting Wildlife Hazard Assessments and Training Curriculums for Airport Personnel Involved in Controlling Wildlife Hazards on Airports, Appendix C. The course therefore is considered acceptable to the FAA Administrator as an airport wildlife hazard management training course as described in the aforementioned AC, Section 6(c)(2).

Amy

Amy L. Anderson
Wildlife Biologist
Federal Aviation Administration
Airport Safety and Standards
800 Independence Avenue SW
Washington DC 20591
Phone: (202) 267-7205

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APPENDIX III: RESUMES/CERTIFICATES

Cody Baciuska
Loomacres Wildlife Management, Inc.
cody@loomacres.com
607-760-8748

EDUCATION:

- **State University of New York, College of Agriculture and Technology at Cobleskill**
  Bachelor of Technology Degree in Animal Science- Concentration Wildlife Management
  Associate of Applied Science Degree- Concentration Fisheries and Wildlife Technology

- **State University of New York at Oneonta**
  Graduate Coursework in Biology
  Bachelors of Science Degree in Business Finance
  In progress

WORK EXPERIENCE:

- **Loomacres Wildlife Management, Inc.**

Co-Owner of Loomacres Wildlife Management. Loomacres provides wildlife and environmental consulting to the aviation industry, government agencies, municipalities, corporations and private individuals. Services range from wildlife and vegetation surveys to development and implementation of wildlife management plans. Loomacres also provides education and training to airport personnel involved in wildlife management.

- **United States Department of Agriculture, Wildlife Services**

Conducting wildlife surveys, habitat assessments, and wildlife hazard assements on a number of airports throughout New York. Data collection, entry, analysis, presentation. Assisting in the development of wildlife management plans. Identifying and addressing, damage, disease, and potential human heath and safety issues created by wildlife. Use of pyrotechnics, firearms and traps to haze and remove hazardous wildlife. Public relations and outreach and education.

- **National Audubon Society**

Operated 7 MAPS Bird Banding Stations, responsible for net setup, extracting birds, aging, sexing, banding, data recording and entry, and overall welfare of the birds captured in the nets. Also conducted point counts, breeding bird surveys, nest searching, and vegetation surveys.

- **Wetland Studies and Solutions**

Wetland restoration and mitigation, Planted a variety of trees and shrubs

LICENCES, TRAINING & CERTIFICATIONS:

- FAA Certified Airport Wildlife Biologist, NRA Certified Firearms Instructor -Airport Driving Cert., FAA Approved Wildlife Biologist Training, - NYS Pistol Permit, -NYS Wildlife Control Permit, -NYS Hunting and Trapping License, Boater Safety Cert

PROFESSIONAL MEMBERSHIPS:

- 2013-present, Steering Committee Chair, Birdstrike-USA
- *2009-present*, President of NYS Wildlife Management Association
- *2007- 2009*, Director of NYS Wildlife Management Association
- *September 2002- January 2003*, Secretary of the SUNY Cobleskill chapter of The Wildlife Society
- *January 2003- May 2003,* Vice President of the SUNY Cobleskill chapter of The Wildlife Society
- *2005-present, Member of National Wildlife Control Operators Association*

State University of New York

College of Agriculture and Technology at Cobleskill

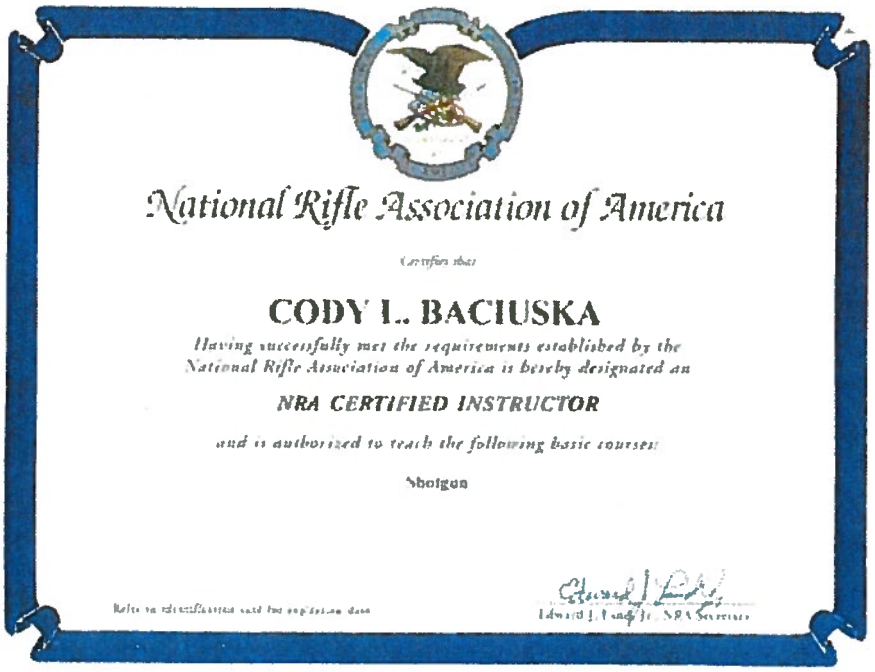
By virtue of the authority vested in it,
and upon recommendation of the Faculty, the Board of Trustees
hereby confers upon

Cody Carue Baciuska

the Degree of

Bachelor of Technology

Given at Cobleskill, New York,
this twentieth day of December, 2003



National Rifle Association of America

Certifies that

CODY L. BACIUSKA

Having successfully met the requirements established by the National Rifle Association of America is hereby designated an

NRA CERTIFIED INSTRUCTOR

and is authorized to teach the following basic courses:

Shotgun

Refer to certification card for expiration date

Edward J. Land Jr., NRA Secretary

Embry-Riddle Aeronautical University

Center for Professional Education
Hereby certifies that

Cody Baciuska

Has successfully completed 2.4 Continuing Education Units in

Wildlife Hazard Management

In Witness Whereof the signatures are authorized by the Board of Trustees and the Seal of the University are hereunto affixed at Daytona Beach, Florida this 18th day of May 2007 Anno Domini.

Martin A. Smith, Chancellor

Gregory A. Popp, J.D., Director

Kristin M. Baciuska

(518) 542-6305
kristin@loomacres.com

EDUCATION: **State University of New York College at Oneonta**
Oneonta, NY 1382
MS *Graduate Program in Biology*

State University of New York, College of Agriculture and Technology at Cobleskill,
Cobleskill, NY 12043
Bachelor of Technology Degree in Plant Science- Conc. Environmental Studies

PROFESSIONAL WORK EXPERIENCE:

- **Loomacres Wildlife Management Inc.**
  July 2005-Current
  Co-owner and FAA Qualified Airport Wildlife Biologist working primarily on Airport Wildlife Hazard Assessments, Wildlife Hazard Management Plans, Training, Data Collection and Vegetation Surveys.
- **State University of New York- Oneonta, NY**
  October 2008-August 2010
  Part time Research Assistant. Worked on a FAA funded grant project titled "Native & Naturalized Turf Species Suitable for Use On Airports Managed for Wildlife Hazards"
  This work is fulfilling a Master's Thesis Requirement.
- **State University of New York –Oneonta, NY**
  September 2007-February 2009
  Part time Research Assistant. Organize collected plant specimens in college herbarium and prepared them for mounting and submission to the NYS Museum and other collections. Plant collection, ID and database creation and entry.
- **USDA Animal Plant Health Inspection Service Wildlife Services- Castleton, NY**
  October 2004 to July 2005
  GS-05 Biological Science Technician Wildlife. Used techniques including pyrotechnics to haze avian species on airports, landfills and in urban areas. Avian and Mammalian Surveys, trapping and database entry. Operated West Nile Virus Hotline. Administrative assistance.

PRESENTATIONS:

- USA/Canada Birdstrike Conference 2010 Salt Lake City, Utah (Speaker)
- Wildlife Management Workshop, Saratoga NY (Poster Presentation)
- USA/Canada Birdstrike Conference 2007,2008 & 2009 (Poster Presentation)

PUBLICATIONS:

- Baciuska, K. (2010) Native and Naturalized Turf Species Suitable for Use on Airports Managed for Wildlife in the Northeastern US. *State University of New York College at Oneonta. Master's Thesis*

CERTIFICATES/LICENCES:

- FAA Qualified Airport Wildlife Biologist 2009
- NYSDEC Commercial Pesticide Applicator 2008
- Embry Riddle Wildlife Hazard Management Workshop-2010
- Rutgers Wetland Delineation Certificate Series 2008

Embry-Riddle Aeronautical University

The Office of Professional Education
hereby certifies that

Kristin Baciuska

Has successfully completed 2.4 Continuing Education Units in the following:

SFY-3000 Airport Wildlife Hazard Management Workshop

In Witness Whereof the signatures are authorized and
the Seal of the University are hereunto affixed at Daytona Beach, Florida
this 22nd day of January 2010 Anno Domini.

Martin A. Smith
Executive Vice President, Embry-Riddle Worldwide

Albert W. Ketchum
Interim Director, Office of Professional Education

State University of New York
College at Oneonta

On the recommendation of the Faculty and by virtue of the authority
vested in them, the Trustees of the University
have conferred upon

Kristin Marie Dorsch

the degree of

Master of Science

and have granted this Diploma as evidence thereof.
Given in the City of Oneonta, in the State of New York, in the United
States of America this twenty-first day of May, two thousand and eleven.

William M. Natali

Loomacres Wildlife Management
Lead Airport Wildlife Biologist
E-mail: mnatali@loomacres.com,

EDUCATION

University of Pittsburgh
Bachelor's degree in Wildlife Biology

WORK EXPERIENCE

Loomacres Wildlife Management
Wildlife Biologist 2010-Present

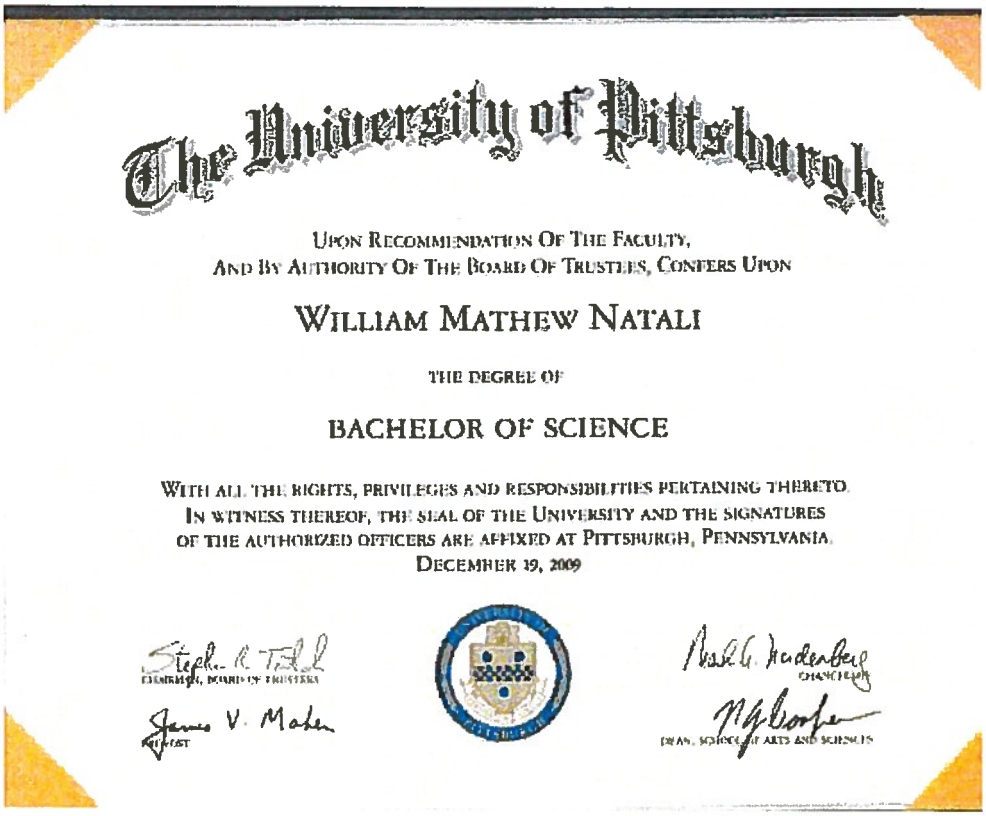
- Conduct Airport Wildlife Hazard Assessments
- Create Wildlife Hazard Management Plans
- Bird and Mammal Surveys on Airports
- Airport Wildlife Management Services & Consulting
- Airport Wildlife Hazard Management and Consulting
- Wildlife Control and Management on Airports & Golf Courses
- Airport Driving and Security
- FAA Qualified Airport Wildlife Biologist

National Aviary
Volunteer and Intern

- Animal Husbandry
- Bird Handling

FIELD EXPERIENCE

- Airport Wildlife Hazard Management Services
- Bird and Bat Mortality Surveys
- Nest Monitoring and Point Count Surveys
- Animal Husbandry
- Identification of Birds by Sight and Sound
- Trapping and Hazing of Wildlife
- Firearms Experience
- Training of Airport Personnel in Wildlife Management and ID



The University of Pittsburgh

Upon Recommendation Of The Faculty,
And By Authority Of The Board Of Trustees, Confers Upon

William Mathew Natali

the degree of

Bachelor of Science

With all the rights, privileges and responsibilities pertaining thereto.
In witness thereof, the seal of the University and the signatures
of the authorized officers are affixed at Pittsburgh, Pennsylvania.
December 19, 2009

CERTIFICATE
OF
COMPLETION

This certificate is awarded to

Mat Natali

LOOMACRES
Wildlife Management

Shawn M. Ferdinand

Loomacres Wildlife Management
Wildlife Biologist
E-mail: shawnf@loomacres.com

Professional Experience:

- Wildlife Biologist
  Loomacres Wildlife Management, Inc.
  - Wildlife Hazard Assessments, Wildlife Hazard Management Plans and training.
  - Passive and active wildlife control methods on airfields.
  - Avian and Mammalian Surveys on airports throughout the US
  - Airport driving experience and familiarity with airport security protocols.
- Fish and Wildlife Technician I
  NYS Department of Environmental Conservation
  Division of Fish, Wildlife & Marine Resources: Wildlife Diversity Unit
  - Completed species of greatest conservation assessments to be used for updating the State Wildlife Action Plan.
- Non-lead Outreach and Education Coordinator
  NYS Department of Environmental Conservation
  Division of Fish, Wildlife & Marine Resources: Sportsman Education & Hunter Safety
  - Developed educational handouts for instructors and students
  - Developed and conducted educational workshops for NYSDEC staff and people of interest
  - Updated NYSDEC sportsman education website

Education:

State University of New York at Cobleskill B.T. Wildlife Management

- Undergraduate Grade Point Average: 3.85

State University of New York at Fredonia B.S. Interdisciplinary Studies – Environmental Sciences

- Undergraduate Grade Point Average: 3.59

Accomplishments:

- Merrill Family Scholarship
- Nancy Garlapow Scholarship
- Academic Excellence: SUNY Fredonia Scholarship
- Dean's List: 6 semesters at SUNY Fredonia and 3 semesters at SUNY Cobleskill

Affiliations:

- The Wildlife Society: 2011-Current
- Trout Unlimited: Spring 2012-Current
- Ducks Unlimited Fall 2012- Current

Computer Skills:

- Knowledge of Microsoft Word, Microsoft PowerPoint, Microsoft Excel, Mini Tab Statistical, ESRI ArcMap, ESRI ArcScence, ESRI ArcView

Volunteer Experience:

- Hemlock Wooly Adelgid Surveying:
  Minekill State Park, Blenheim, NY
- Wildlife Rehabilitation:
  Assisted at Kelly Martin's, Middleburgh, NY
- Educational Community Walk on Stream Ecology
  SUNY Fredonia, Fredonia, NY

State University of New York

College of Agriculture and Technology at Cobleskill

By virtue of the authority vested in it,
and upon recommendation of the Faculty, the Board of Trustees
hereby confers upon

Shawn M Ferdinand

the Degree of

Bachelor of Technology

given at Cobleskill, New York,
this fifteenth day of December, 2012

STATE UNIVERSITY OF NEW YORK

AT FREDONIA

on the recommendation of the Faculty
and by virtue of the authority vested in them
the Trustees of the State University of New York have conferred on

Shawn M. Ferdinand

the degree of

Bachelor of Science

Magna Cum Laude

and have granted this diploma as evidence thereof
given in the Village of Fredonia in the State of New York
in the United States of America in the month of May,
two thousand and eleven.

CERTIFICATE OF COMPLETION

This certificate is awarded to:

Shawn Ferdinand

For successfully completing **Loomacres Wildlife Management's** Advanced Airport Wildlife Hazard Management Training Course at the Columbia Metropolitan Airport March 12-14 2013. This individual meets the *training* requirements set forth by the FAA under Title 14, Code of Federal Regulations, Part 139 and AC No: 150/5200-36A Qualifications for Wildlife Biologists Conducting Wildlife Hazard Assessments.

LOOMACRES Wildlife Management

Cody L. Baciuska — 3/25/13 Date

Bill Antonides

Loomacres Wildlife Management, Inc.

(800) 243-1462

EDUCATION

South Dakota State University

BS Biology and Wildlife and Fisheries Science

AREAS OF EXPERTISE

- Experience in completing FAA-approved WHAs and WHMPs
- Extensive wildlife damage control and habitat management experience, both on and off the airport

JOB EXPERIENCE

- F A A Qualified Airport Wildlife Biologist & Wildlife Hazard Management Specialist
- Wildlife Conservation Officer - SD Department of Game, Fish and Parks
- FAA-certified instructor for the annual training course required by AC 150/5200-36A

MILITARY EXPERIENCE

- Military Police - U.S. Army, honorable discharge
- Security Specialist - U.S. Air Force Air National Guard, honorable discharge

TRAINING

- USDA Aphis Airport Wildlife Hazard Management Training
- Embry-Riddle Wildlife Hazard Management Workshop - Denver, Colorado
- Joint Bird Strike Committee-USA/Birdstrike Committee-Canada Meetings

REGISTRATIONS

- Qualified Airport Wildlife Biologist under AC 150/5200-36A
- South Dakota Certified HuntSAFE Instructor
- Certified Wildlife Biologist
- Certified Pesticide Applicator

The Wildlife Society

INCORPORATED IN WASHINGTON, DC

grants the designation

Certified Wildlife Biologist

to

William J. Antonides

in recognition of fulfillment of all the professional requirements approved by The Wildlife Society and verified by the Society's Certification Review Board on the 25th day of August 1998. This certificate remains valid provided membership in the Society remains in good standing.

President, The Wildlife Society

Chairman, Certification Review Board

Executive Director, The Wildlife Society

Jonathan C. Wills

618-731-8092
jwills@Loomacres.com

Education:

Murray State University Murray, Kentucky
Degree: Bachelor of Science Aug. 2005-May 2008
Area: Wildlife Biology

Rend Lake College Ina, Illinois
Degree: Associate of Science Aug. 2003-May 2005
Area: Science

Professional Skills: Airport Wildlife Management, Dendrology, ArcGIS, Field Botany, Ornithology, Herpetology and Wildfire Training

Professional Experience:

Loomacres Wildlife Management, Inc.
Wildlife Biologist

- Avian & Mammalian Surveys
- Wildlife Hazard Assessments, Management Plans & Training
- Nuisance wildlife mitigation in an airport setting
- Airport Driving & Security
- ATF certified
- Nuisance Wildlife Control Operator permitted

Colorado Parks and Wildlife
Swift Fox Field coordinator, Turkey Telemetry

- Landowner coordination and outreach
- Operated a trail camera (Reconyx PC800)
- Radio telemetry, GPS, Map Interpretation, Orienteering
- Experience working on Military maneuver grounds

Illinois Department of Natural Resources
Researcher 1, Deer Telemetry

- ArcGIS
- GPS, Aerial and Radio Telemetry
- Aerial telemetry
- Deer capture, tranquilization

Active Memberships

- Ducks Unlimited
- The Wildlife Society

CERTIFICATE
OF
COMPLETION

This certificate is awarded to

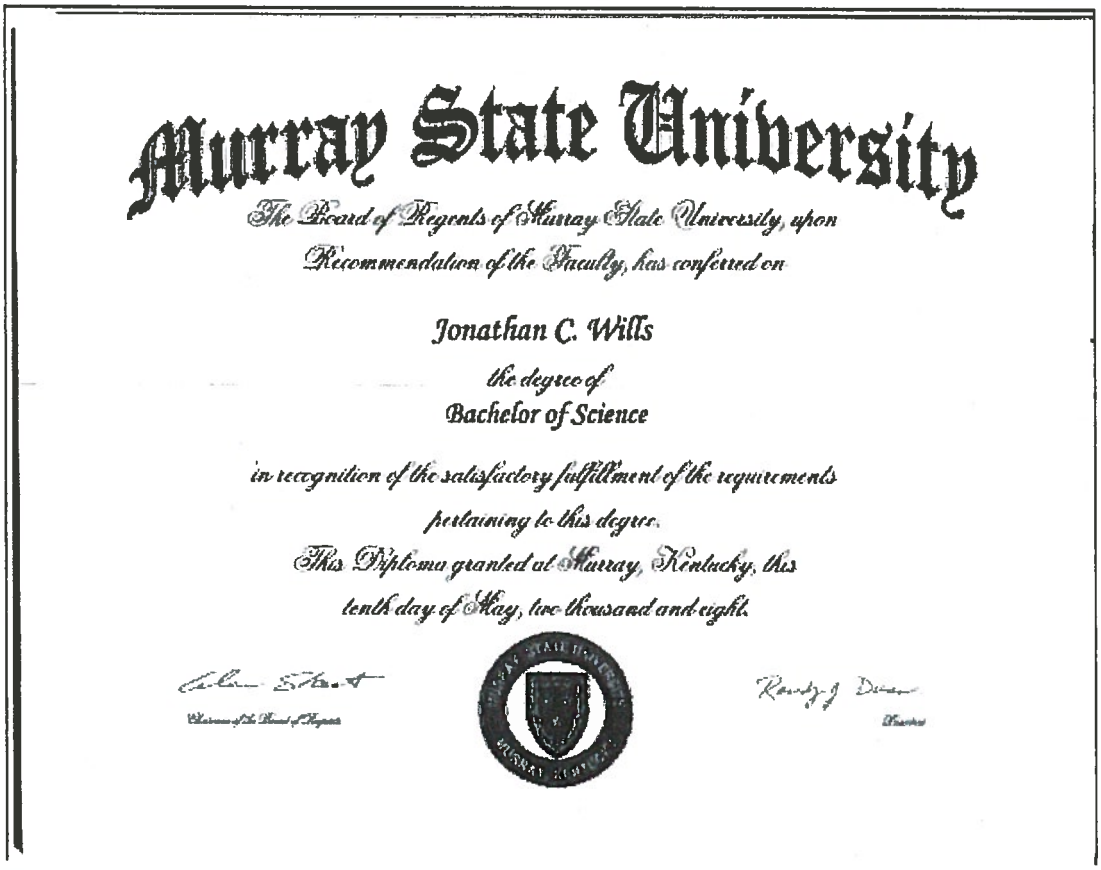
Jon Wills

For successfully completing Loomacres Wildlife Management's Advanced Airport Wildlife Hazard Management Training Course at the Columbus Metropolitan Airport March 12-14 2013. This individual meets the training requirements set forth by the FAA under Title 14, Code of Federal Regulations, Part 139 and AC No: 150/5200-36A Qualifications for Wildlife Biologists Conducting Wildlife Hazard Assessments

LOOMACRES
Wildlife Management

Cody L. Barnes

3/14/2013
Date



Murray State University

The Board of Regents of Murray State University, upon
Recommendation of the Faculty, has conferred on

Jonathan C. Wills

the degree of
Bachelor of Science

in recognition of the satisfactory fulfillment of the requirements
pertaining to this degree.
This Diploma granted at Murray, Kentucky, this
tenth day of May, two thousand and eight.

Ted Igleheart

Loomacres Wildlife Management
Airport Wildlife Biologist

EDUCATION

University of Maine, Wildlife Ecology
University of Kentucky, Wildlife Biology

WORK EXPERIENCE

Loomacres Wildlife Management
Wildlife Biologist

- Conduct Airport Wildlife Hazard Assessments
- Create Wildlife Hazard Management Plans
- Bird and Mammal Surveys on Airports
- Wildlife Control and Management on Airports
- Airport Driving and Security
- FAA Qualified Airport Wildlife Biologist

Bureau of Land Management, Worland WY
Wildlife Biologist

- Responsible for the management of large mammals on BLM lands

CERTIFICATE OF COMPLETION

This certificate is awarded to:

Ted Igleheart

For successfully completing **Loomacres Wildlife Management's** Advanced Airport Wildlife Hazard Management Training Course at the Elmira Corning Regional Airport August 27-29 2012. This individual meets the *training* requirements set forth by the FAA under Title 14, Code of Federal Regulations, Part 139 and AC No: 150/5200-36A Qualifications for Wildlife Biologists Conducting Wildlife Hazard Assessments.

LOOMACRES Wildlife Management

Cody L. Baciuska

8/30/2012
Date

APPENDIX IV: TRAINING OUTLINE

8 Hour Wildlife Hazard Management and Bird Biology Training

General Outline

1 Introduction & Overview of Training Objectives
- A. Authority, Regulations, Legalities
- B. Wildlife Hazard Management Plan

2 General Challenges to Aviation Safety Presented by Wildlife
- A. Large and Small Mammals
- B. Various Avian Species
- C. On and Off-site Attractants

3 Practical Management Techniques
- A. Food, Cover, & Water
- B. Habitat Modification & Exclusion
  - a. Grass Management
  - b. Fencing
  - c. Brush Removal
- C. Repellents
  - a. Chemical, Audio, Visual
- D. Removal
  - a. Lethal
  - b. Non-Lethal

4 Reporting Procedures & Database
- A. Bird/Other Wildlife Strike Report

5 Maintenance of State & Federal Permits

7 Bird identification & Bird Biology
- A. Topography
- B. Flight and Feathers
- C. Molt and Migration
- B. Identification

8. Pyrotechnics and firearms usage and safety

9. Review and Exam

APPENDIX V: PROOF OF INSURANCE

ACORD

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): 12/17/2013

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME: Lynn Burns
Eastern Shore Associates 101 Cayuga Street P.O. Box 480 Fulton NY 13069	PHONE (A/C, No, Ext): (315)598-6000 FAX (A/C, No): (315)598-1183 E-MAIL ADDRESS: lburns@esainsurance.com
INSURED	**INSURER(S) AFFORDING COVERAGE** / **NAIC #**
Loomacres Inc Po Box 361 Warnerville NY 12187	INSURER A: Travelers Casualty Ins Co of 19046 INSURER B: Travelers Indemnity Company 25658 INSURER C: INSURER D: INSURER E: INSURER F:

COVERAGES CERTIFICATE NUMBER: 13-14 Master REVISION NUMBER:

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	GENERAL LIABILITY X COMMERCIAL GENERAL LIABILITY CLAIMS-MADE X OCCUR X CGD1050494, CGP2041103 GEN'L AGGREGATE LIMIT APPLIES PER X POLICY PRO-JECT LOC			680-1647P823-13-42	10/23/2013	10/23/2014	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG	$ 2,000,000 $ 300,000 $ 5,000 $ 2,000,000 $ 4,000,000 $ 4,000,000
B	AUTOMOBILE LIABILITY X ANY AUTO ALL OWNED AUTOS SCHEDULED AUTOS HIRED AUTOS NON-OWNED AUTOS			BA-1652P593-13-SEL	10/23/2013	10/23/2014	COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident) Medical payments	$ 1,000,000 $ $ $ $ 5,000
B	X UMBRELLA LIAB X OCCUR EXCESS LIAB CLAIMS-MADE DED X RETENTION $ 10,000			CUP-1704P176-13-42	10/23/2013	10/23/2014	EACH OCCURRENCE AGGREGATE	$ 3,000,000 $ 3,000,000
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) Y/N If yes, describe under DESCRIPTION OF OPERATIONS below	N/A					WC STATU-TORY LIMITS OTH-ER E.L. EACH ACCIDENT E.L. DISEASE - EA EMPLOYEE E.L. DISEASE - POLICY LIMIT	$ $ $

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101 Additional Remarks Schedule, if more space is required)

CERTIFICATE HOLDER	CANCELLATION
County of Mercer 640 South Broad Street Trenton, NJ 08650-0068	SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS. AUTHORIZED REPRESENTATIVE Sheila Casper/GAIL

ACORD 25 (2010/05) INS025 (201001)

APPENDIX VI: REFERENCE LETTERS

Charlotte·Douglas
INTERNATIONAL AIRPORT

May 25, 2014

To whom it may concern:

I would like to recommend Loomacres Wildlife Management for the services of Wildlife Hazard Assessments, Wildlife Control and FAA Wildlife Hazard Management Training. The Charlotte Douglas International Airport has been using Loomacres Wildlife Management since June 2013 for a new Wildlife Hazard Assessment and our annual FAA Wildlife Hazard Management Training. In our time using Loomacres, I have experienced nothing but quality services from a truly knowledgeable and professional group of Wildlife Biologists. This month, Loomacres completed the field work for the airport's new Wildlife Hazard Assessment. During the last 12 months spending time with the biologists assigned to this project I was reaffirmed time and time again that we went with the right organization for this kind of work. Loomacres truly specializes in *airport* wildlife hazard management and they understand the needs of their clients, airport professionals.

Loomacres has always been accessible to us for any questions, concerns or special circumstances that have arisen. In early October, 2013, our airport experienced a significant and drastic increase in bird strikes in a matter of a few days. The biologists with Loomacres were there to answer all questions we had about this circumstance and analyze data to give us an opinion on what was happening and recommend measures to mitigate the issues we were seeing. This was all completely separate from the Wildlife Hazard Assessment project that was ongoing at the time. This is just one of many examples of how Loomacres personnel are willing to go the extra mile to satisfy the needs of their clients. They all truly have a passion for airport wildlife hazard management and it shows in the quality and professionalism of their work.

The Charlotte Douglas International Airport contracted Loomacres Wildlife Management for our annual FAA Wildlife Hazard Management Training course in April, 2014. The training course was thorough, informative and engaging. I received great feedback from our Airport Operations Officers about the course being very interesting and different from other courses they had attended in the past. All the requirements for FAA Wildlife Hazard Management Training were fulfilled in this course in a fun and engaging manner. We liked this course so much that we have booked Loomacres to conduct another training session for June, 2014.

I highly recommend Loomacres Wildlife Management for any airport wildlife management services you may be looking to fulfill. If you have any further questions that I may be able to answer about our experience with their services, do not hesitate to contact me and I will be happy to help.

Sincerely,

David J. Castaneda, ACE
Airport Wildlife Coordinator, Certified Wildlife Damage Control Agent
djcastaneda@cltairport.com
Cell: 704-574-6848

charlotteairport.com | PO Box 19066 | Charlotte, NC 28219 | P: 704.359.4000 | F: 704.359.4030
Owned and operated by the City of Charlotte

HUNTSVILLE INTERNATIONAL AIRPORT • INTERNATIONAL INTERMODAL CENTER • JETPLEX INDUSTRIAL PARK

May 23, 2014

To Whom It Concerns:

I would like to take this opportunity to recommend Loomacres Wildlife Management for wildlife management services. Huntsville International Airport contracted with Loomacres during the period from January 2011 to March 2012 for the purpose of conducting a Wildlife Hazard Assessment as required by the Federal Aviation Administration. The full scope of services provided by Loomacres during this timeframe was (1) a Wildlife Hazard Assessment, (2) Wildlife Hazard Management Training for Airport personnel pursuant to the requirements of 14 CFR Part 139, and (3) ongoing wildlife control services to augment and complement our in-house control measures.

During this timeframe, Loomacres did an outstanding job and fulfilled everything within their scope. They were very professional and established a very good rapport with all personnel, tenants, and customers involved. The Airport has since established an FAA-approved Wildlife Hazard Management Plan (written by Loomacres) and has again contracted with Loomacres for continued wildlife control, consulting, and training services.

I would highly recommend them for any similar projects. If you would like to discuss further, please contact me at 256-258-1201 or rgardner@hsvairport.org.

Respectfully,

Ryan Gardner, C.M.
Operations Manager
Huntsville-Madison County Airport Authority
1000 Glenn Hearn Blvd Box 20008
Huntsville, Al 35824

HUNTSVILLE-MADISON COUNTY AIRPORT AUTHORITY

BUFFALO NIAGARA

Airfield Operations
251 Cayuga Road
Buffalo, New York 14225

06/04/14

Dear Sir or Madam,

I would like to take a moment and share my experiences with Loomacres Wildlife Management. Loomacres first provided wildlife training to the Buffalo International Airport in 2007. From then on we have continued to utilize their services. They have provided the airport with our annual FAA wildlife hazard management training, wildlife permitting and control services, wildlife hazard management program evaluations, and wildlife hazard management plan updates.

In 2011 Loomacres was selected to perform Wildlife Hazard Assessments at both of NFTA's airport; Buffalo Niagara International Airport and Niagara Falls International Airport. We were very happy with their performance and their WHA reports have been accepted by the FAA.

I would strongly recommend Loomacres Wildlife Management for any services related to Airport Wildlife Hazard Mitigation and Wildlife Hazard Assessments.

Sincerely,

David C. Macy, Airfield Supervisor
Buffalo Niagara International Airport